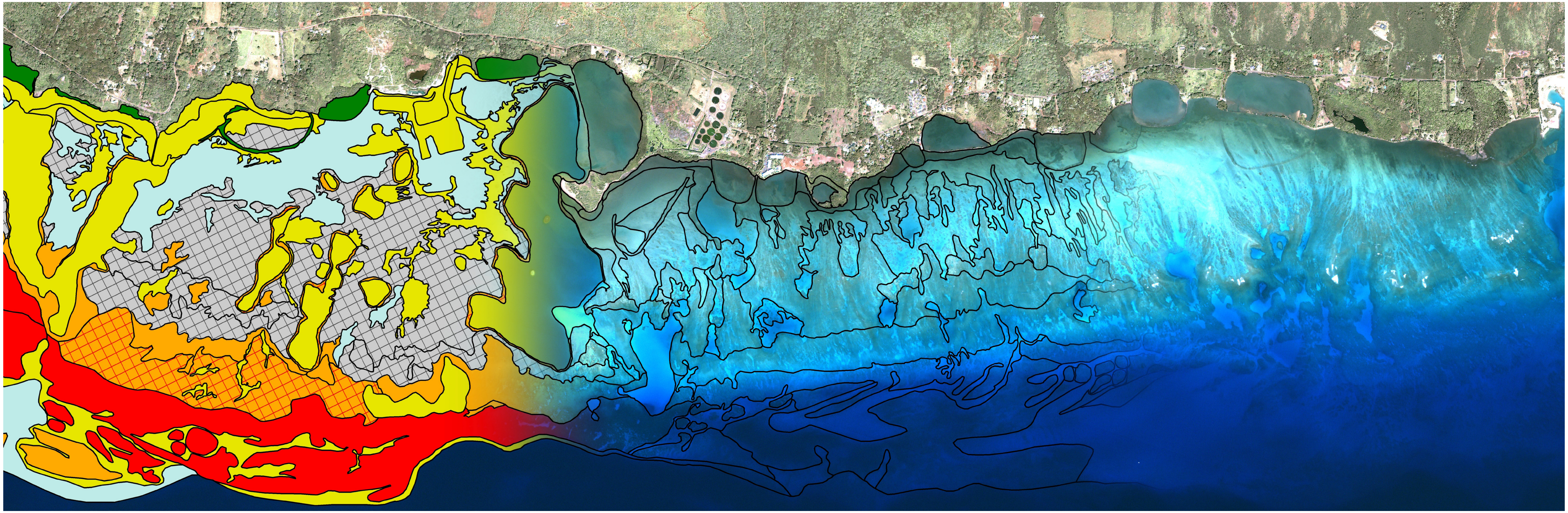
Atlas of the Shallow-Water Benthic Habitats of the Main Hawaiian Islands



U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service
National Centers for Coastal Ocean Science
Center for Coastal Monitoring and Assessment
Biogeography Branch

September 2007

NOAA Technical Memorandum NOS NCCOS 61

Disclaimer

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The maps depicted in this atlas are not to be used for navigational purposes.

Citation

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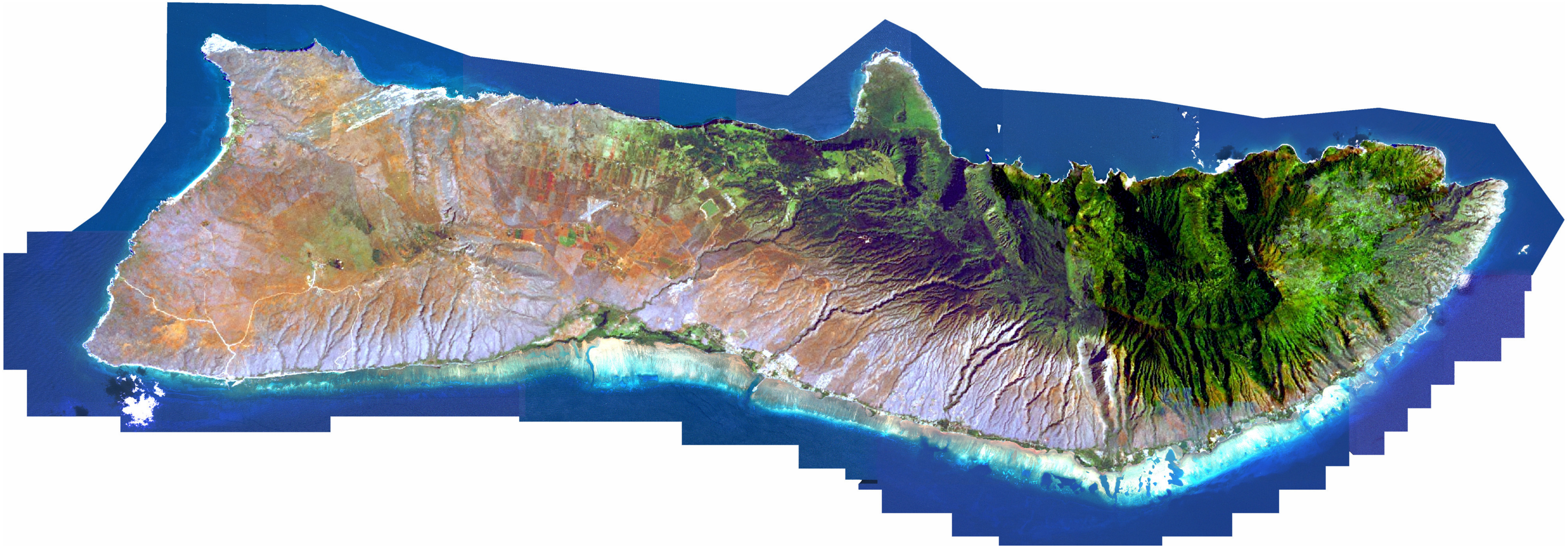
- Hawaii's Department of Land and Natural resources
- Hawaii Institute of Marine Biology
- Oceanic Institute
- NOAA Pacific Island Fisheries Science Center, Coral Reef Ecosystem Division
- Analytical Laboratories of Hawaii
- BAE Systems Spectral Solutions LLC
- GeoEye
- Digital Globe

The maps contained in the Atlas of the Shallow-Water Benthic Habitats of Main Hawaiian Island have been reviewed by numerous scientists and managers who are familiar with the nearshore environment of the Hawaiian archipelago. Three review sessions were held, one each on Oahu, Maui, and Hawaii during July 2007.

Related Products

In addition to this Atlas, a DVD is available which contains all the data used to produce the maps portrayed in the Atlas. The DVD contains the digital multispectral satellite imagery, accuracy assessment field data, ground validation field data, spatial accuracy field data, benthic habitat GIS files, final reports, and shoreline GIS files. These digital data can be incorporated into a GIS or other software for further use and analysis. The DVD also contains the metadata, the habitat digitizer extension used to generate the benthic habitat delineations, final reports, and a description of mapping methodology and results.

The data on the DVD is also available on the Internet at http://www.ccma.nos.noaa.gov/products/biogeography/hawaii_cd_07/welcome.html



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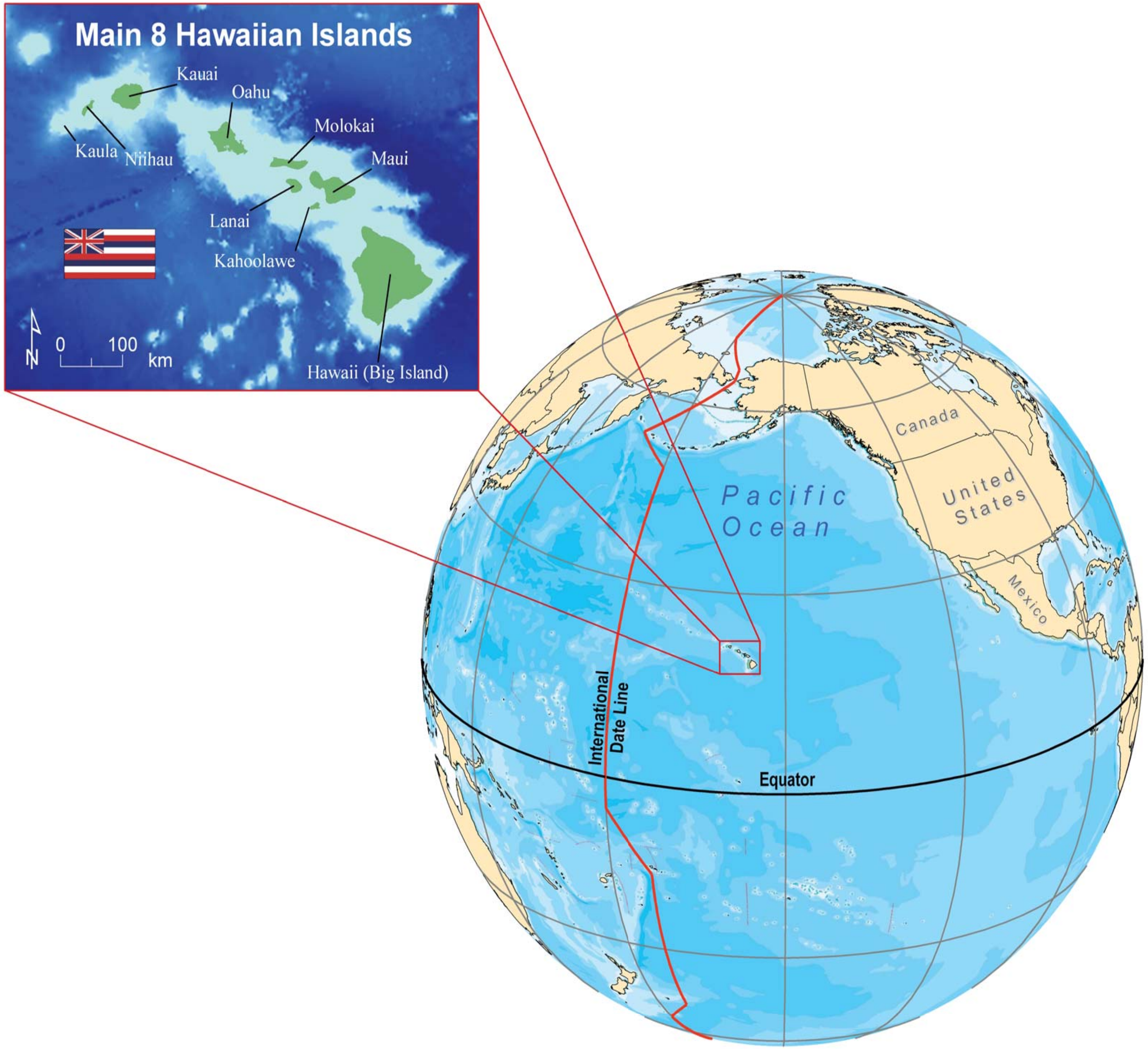

Main 8 Hawaiian Islands
Kauai
Oahu
Molokai
Maui
Kaula
Niihau
Lanai
Kahoolawe
Hawaii (Big Island)
N
0
100
km
Canada
United States
Mexico
Pacific Ocean
International Date Line
Equator

Introduction

The National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) initiated a coral reef research program in 1999 to map, assess, inventory, and monitor U.S. coral reef ecosystems (Monaco et al. 2001). These activities were implemented in response to requirements outlined in the Mapping Implementation Plan developed by the Mapping and Information Synthesis Working Group (MISWG) of the Coral Reef Task Force (CRTF) (MISWG 1999). As part of the MISWG of the CRTF, NOS' Biogeography Team has been charged with the development and implementation of a plan to produce comprehensive digital coral-reef ecosystem maps for all U.S. States, Territories, and Commonwealths within five to seven years. Joint activities between Federal agencies are particularly important to map, research, monitor, manage, and restore coral reef ecosystems. In response to the Executive Order 13089 and the Coral Reef Conservation Act of 2000, NOS is conducting research to digitally map biotic resources and coordinate a long-term monitoring program that can detect and predict change in U.S. coral reefs, and their associated habitats and biological communities.

Most U.S. coral reef resources have not been digitally mapped at a scale or resolution sufficient for assessment, monitoring, and/or research to support resource management. Thus, a large portion of NOS' coral reef research activities has focused on mapping of U.S. coral reef ecosystems. The map products will provide the fundamental spatial organizing framework to implement and integrate research programs and provide the capability to effectively communicate information and results to coral reef ecosystem managers. Although the NOS coral program is relatively young, it has had tremendous success in advancing towards the goal to protect, conserve, and enhance the health of U.S. coral reef ecosystems. One objective of the program was to create benthic habitat maps to support coral reef research to enable development of products that support management needs and questions. An initial step in producing benthic habitat maps was the development of a habitat classification scheme. The purpose of this document is to outline the benthic habitat classification scheme and protocols used to map the main eight Hawaiian Islands.

The purpose of this Atlas is to provide maps depicting the GIS benthic habitat data produced, and outline the benthic habitat classification scheme and protocols used to map the main Hawaiian Islands.

Thirty-two distinct benthic habitat types (i.e., 4 major and 14 detailed geomorphological structure classes; 8 major and 3 detailed biological cover types) within 13 zones were digitally mapped in GIS (geographic information system) using heads-up visual interpretation of orthorectified satellite imagery.

Methods: Classification Scheme

Developing the Habitat Classification Scheme

A hierarchical classification scheme was created to define and delineate shallow-water benthic habitats. The classification scheme was influenced by many factors including:

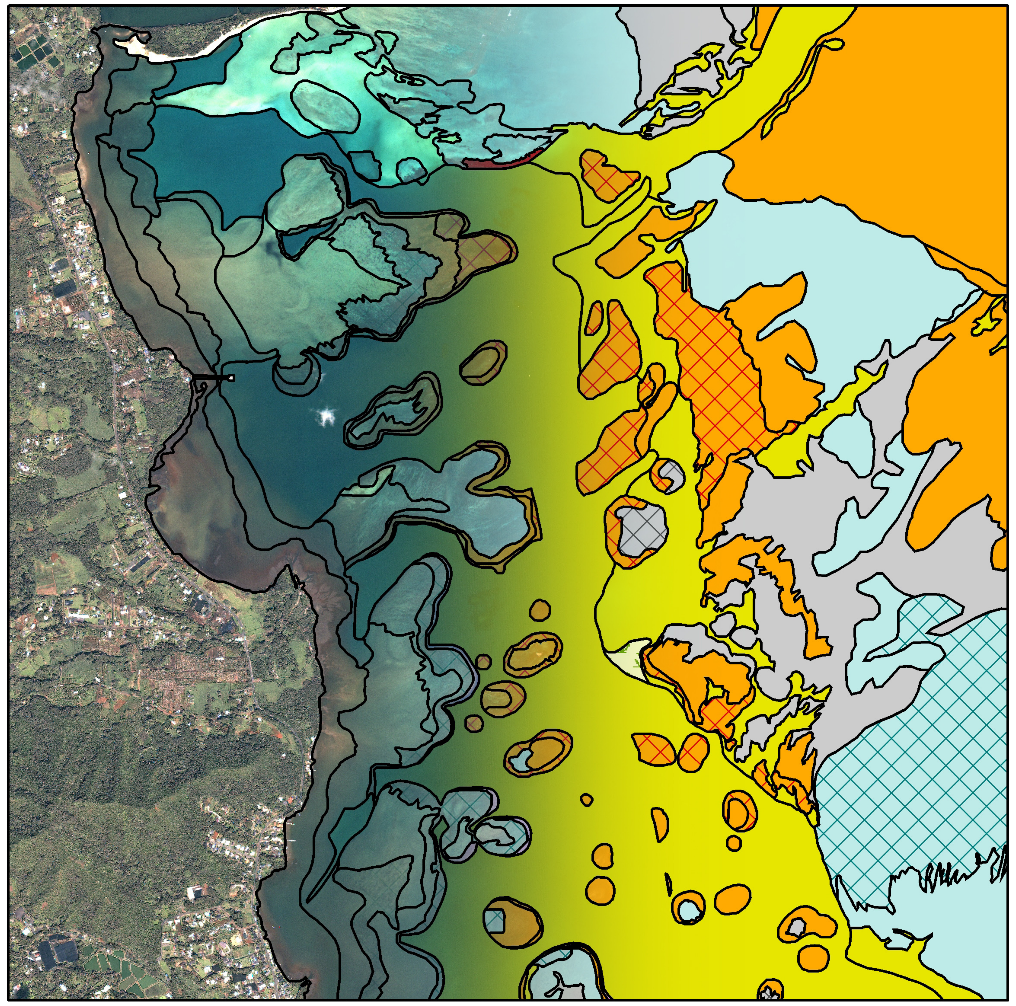
1. Requests from the management community
2. NOS's coral reef mapping experience in the Pacific and U.S. Caribbean.
3. Existing classification schemes for the U.S. Pacific Territories, Northwestern and Republic of Palau (NCCOS 2005 Shallow-Water Benthic Habitats of American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands; NOAA 2003 Atlas of the shallow-water benthic habitats of the Northwestern Hawaiian Islands; Battista et al. 2007)
4. Quantitative habitat data for the U.S. Pacific Territories and Hawaiian Archipelago.
5. The minimum mapping unit (MMU - 1 acre for visual imagery interpretation)
6. Analysis of the spatial and spectral limitations of satellite IKONOS imagery

The hierarchical scheme allows users to expand or collapse the thematic detail of the resulting map to suit their needs. This is an important aspect of the scheme as it will provide a "common language" to compare and contrast digital maps developed from complementary remote sensing platforms. Furthermore, it is encouraged that additional hierarchical categories be added in the resulting geographic information system by users with more detailed knowledge or data for specific areas. For example, habitat polygons smaller than the MMU can be delineated, such as individual patch reefs, or habitat polygons delineated as colonized pavement using this scheme could be further attributed with health information (i.e., bleached, percent live cover) or species composition.

The hierarchical scheme was prepared through consultation, meetings, and workshops that included key coral reef biologists, mapping experts, and professionals throughout the pacific. Modifications were made throughout the development process based upon feedback provided by workshop participants and other contributors. Additional modifications were made during the mapping process to ensure that each category definition reflected the intended habitats and zones encountered in the field as accurately as possible. For instance, the separation of biological cover and geomorphological structure in the present scheme represents a significant evolution of previous versions of the classification schemes developed for mapping of the Caribbean in 1999 and of the Hawaiian Islands in 2000.

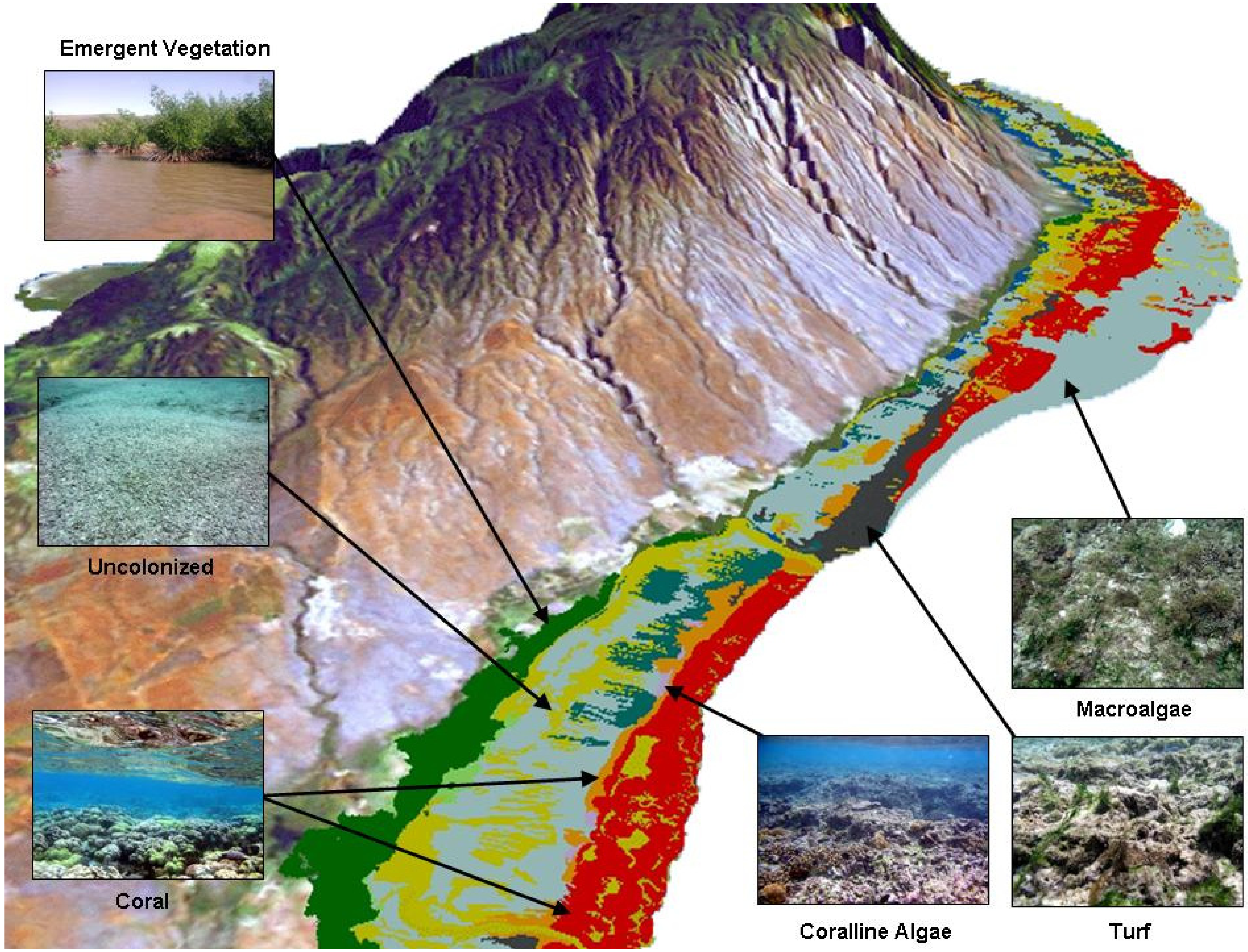
Classification Scheme Description

The classification scheme defines benthic habitats on the basis of three attributes: large geographic "zones" which are comprised of smaller geomorphological structure and biological cover of the reef system. Every polygon on the benthic community map will be assigned a structure and cover within a zone (i.e., uncolonized sand in the lagoon or coral on aggregate reef on the bank). Biological cover and geomorphological structure are further defined by three density classes. Zone indicates polygon location. Biological cover indicates the predominate biological component colonizing the surface of the feature. Geomorphological structure indicates the physical structural composition of the feature. The description of each cover and structure includes an example image. The zone descriptions include schematic descriptions. The hierarchical scheme was prepared through consultation, meetings, and workshops that included key coral reef biologists, mapping experts, and professionals throughout the island territories. The separation of biological cover and geomorphological structure in the present scheme represents a significant evolution of previous versions of the classification schemes developed for mapping of the Caribbean and Hawaiian Islands in 1999 and 2000, respectively.



Classification Scheme Description: Cover

Eighteen distinct and non-overlapping biological cover types were identified that could be mapped through visual interpretation of the IKONOS imagery. Habitats or features that cover areas smaller than the MMU were not considered. For example, uncolonized sand halos surrounding coral patch reefs are too small to be mapped independently. Cover type refers only to predominate biological component colonizing the surface of the feature and does not address location (e.g., on the shelf or in the lagoon). The cover types are defined in a collapsible hierarchy ranging from eight major classes (coral, seagrass, macroalgae, coralline algae, turf algae, emergent vegetation, uncolonized, and unknown), combined with a density modifier representing the percentage of the predominate cover type (10%-<50% sparse, 50%-<90% patchy, 90%-100% continuous).

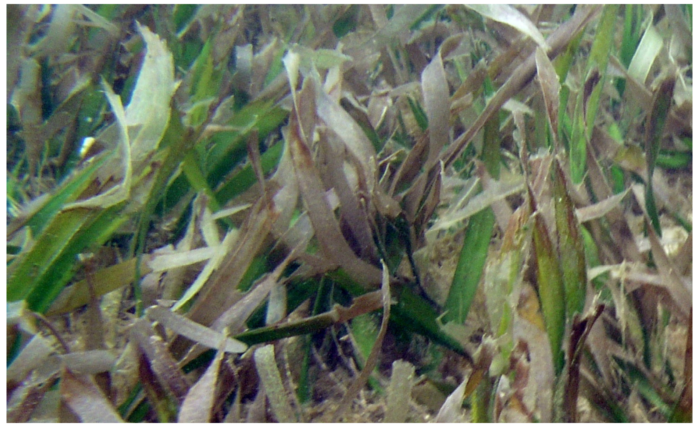


Live Coral
Substrates colonized by live reef building corals and other organisms. Habitats within this category have at least 10% live coral cover.

Continuous Coral: Live coral covering 90% or greater of the substrate. May include areas of less than 90% coral cover on 10% or less of the total area that are too small to be mapped independently (less than the MMU).

Patchy Coral: Discontinuous live coral with breaks in coverage that are too diffuse or irregular, or result in isolated patches of coral that are too small (smaller than the MMU) to be mapped as continuous coral. Overall live coral cover is estimated at 50%-<90% of the bottom.

Sparse Coral: Discontinuous live coral with breaks in coverage that are too diffuse or irregular, or result in isolated patches of coral that are too small (smaller than the MMU) to be mapped as continuous coral. Overall live coral cover is estimated at 10%-<50% of the bottom.



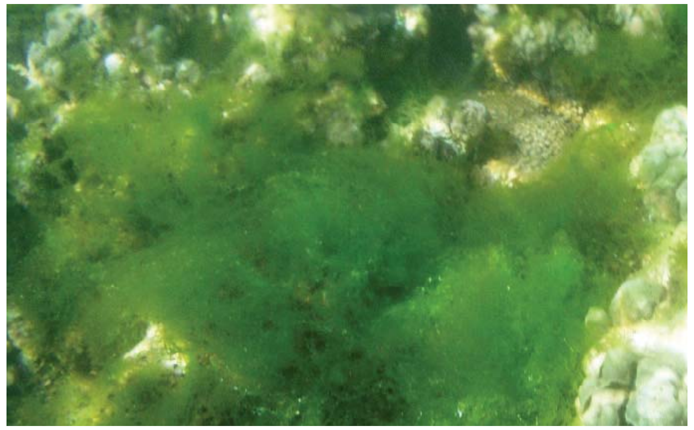
Seagrass
Habitat with 10 percent or more of seagrass.

Continuous Seagrass: Seagrass community covering 90 percent or greater of the substrate. May include blowouts of less than 10 percent of the total area that are too small to be mapped independently (less than the MMU).

Patchy Seagrass: Discontinuous seagrass community with breaks in coverage that are too diffuse or irregular, or result in isolated patches of seagrass that are too small (smaller than the MMU) to be mapped as continuous seagrass. Overall cover is estimated at 50%-<90% of the bottom.

Sparse Seagrass: Discontinuous seagrass community with breaks in coverage that are too diffuse or irregular, or result in isolated patches of seagrass that are too small (smaller than the MMU) to be mapped as continuous seagrass. Overall cover is estimated at 10%-<50% of the bottom.

Macroalgae



Substrates with 10 percent or greater coverage of any combination of numerous species of red, green, or brown macroalgae. Usually occurs in shallow backreef and deeper waters on the bank/shelf zone.

Continuous Macroalgae: Macroalgae covering 90 percent or greater of the substrate. May include blowouts of less than 10 percent of the total area that are too small to be mapped independently (less than the MMU).

Patchy Macroalgae: Discontinuous macroalgae with breaks in coverage that are too diffuse or irregular, or result in isolated patches of macroalgae that are too small (smaller than the MMU) to be mapped as continuous macroalgae. Overall cover is estimated at 50%-<90% of the bottom.

Sparse Macroalgae: Discontinuous macroalgae with breaks in coverage that are too diffuse or irregular, or result in isolated patches of macroalgae that are too small (smaller than the MMU) to be mapped as continuous macroalgae. Overall cover is estimated at 10%-<50% of the bottom.

Encrusting/Coralline Algae

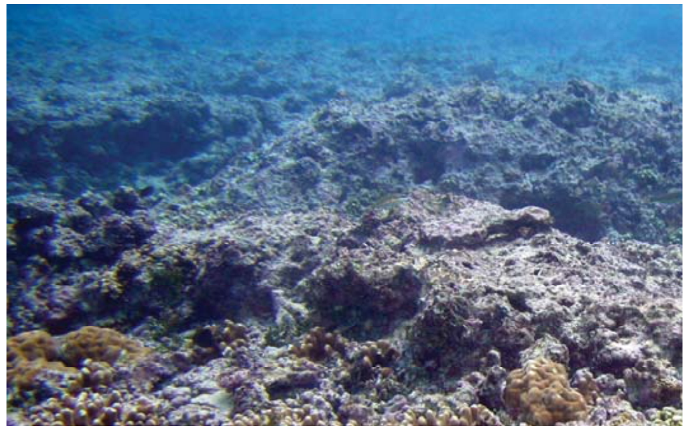
An area with 10 percent or greater coverage of any combination of numerous species of encrusting or coralline algae. May occur along reef crest, in shallow back reef, relatively shallow waters on the bank/shelf zone, and at depth.

Continuous Coralline Algae: Coralline algae covering 90 percent or greater of the substrate. May include blowouts of less than 10 percent of the total area that are too small to be mapped independently (less than the MMU).

Patchy Coralline: Discontinuous coralline algae with breaks in coverage that are too diffuse or irregular, or result in isolated patches of coralline algae that are too small (smaller than the MMU) to be mapped as continuous coralline algae. Overall cover is estimated at 50%-<90% of the bottom.

Sparse Coralline: Discontinuous coralline algae with breaks in coverage that are too diffuse or irregular, or result in isolated patches of coralline algae that are too small (smaller than the MMU) to be mapped as continuous coralline algae. Overall cover is estimated at 10%-<50% of the bottom.

Turf Algae



A community of low lying species of marine algae composed of any or a combination of algal divisions dominated by filamentous species lacking upright fleshy macroalgal thali.

Continuous Turf: Turf algae covering 90 percent or greater of the substrate. May include blowouts of less than 10 percent of the total area that are too small to be mapped independently (less than the MMU).

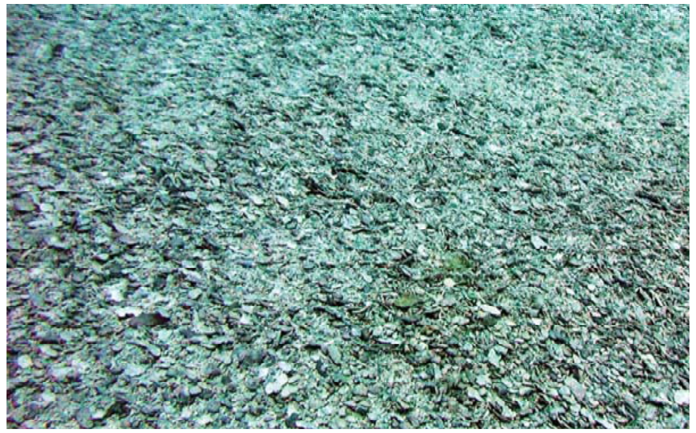
Patchy Turf: Discontinuous Turf algae with breaks in coverage that are too diffuse or irregular, or result in isolated patches of Turf algae that are too small (smaller than the MMU) to be mapped as continuous Turf algae. Overall cover is estimated at 50%-<90% of the bottom.

Sparse Turf: Discontinuous Turf algae with breaks in coverage that are too diffuse or irregular, or result in isolated patches of Turf algae that are too small (smaller than the MMU) to be mapped as continuous Turf algae. Overall cover is estimated at 10%-<50% of the bottom.

Emergent Vegetation

Emergent habitat composed primarily of *Rhizophora mangle* (red mangrove) and *Hibiscus* sp (hau) trees. Generally found in areas sheltered from high-energy waves. This habitat type is usually found in the shoreline/intertidal or reef flat zone.

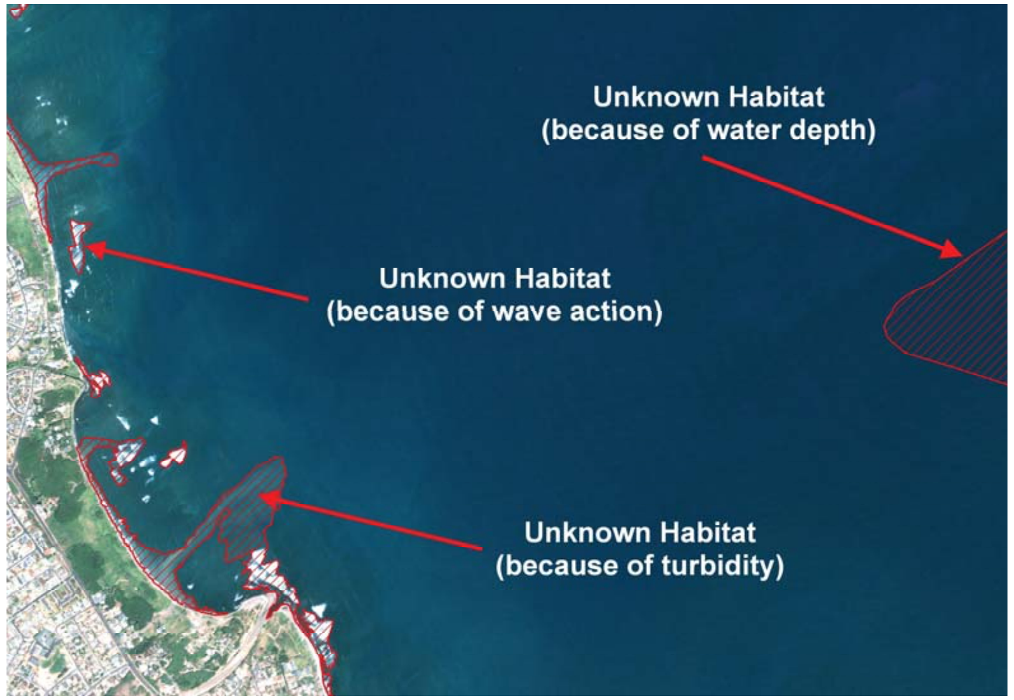
Uncolonized



Substrates not covered with a minimum of 10% of any of the above biological cover types. This habitat is usually on sand or mud structures. Overall uncolonized cover is estimated at 90%-100% of the bottom.

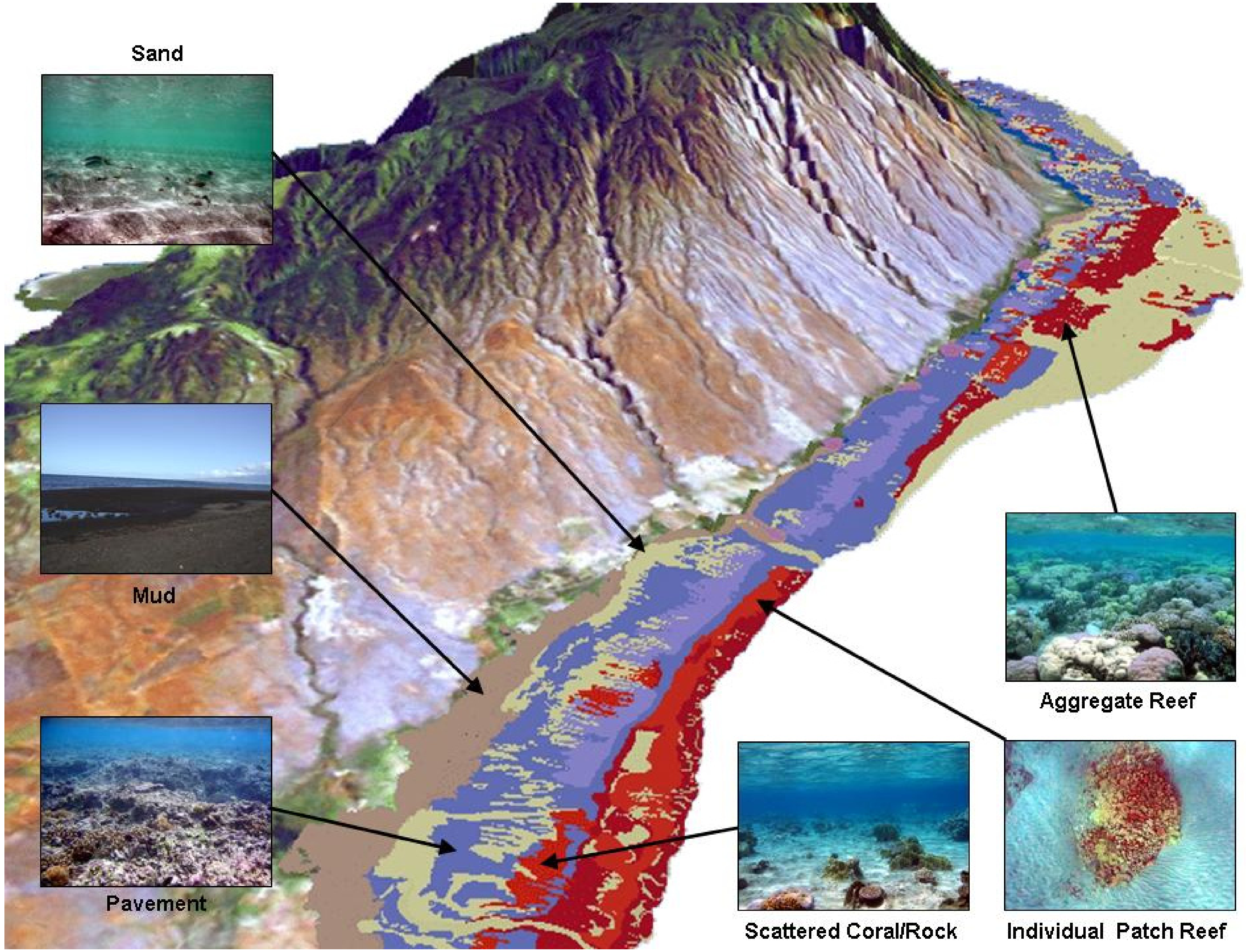
Unknown

Zone, Cover, and Structure uninterpretable due to turbidity, cloud cover, water depth, or other interference.



Classification Scheme Description: Structure Types

Fourteen distinct and non-overlapping geomorphological structure types were identified that could be mapped by visual interpretation of the IKONOS imagery. Habitats or features that cover areas smaller than the MMU were not considered. For example, sand halos surrounding patch reefs are too small to be mapped independently. Structure refers only to predominate physical structural composition of the feature and does not address location (e.g., on the shelf or in the lagoon). The structure types are defined in a collapsible hierarchy ranging from four major classes (coral reef and hardbottom, unconsolidated sediment, other delineations, and unknown), to thirteen detailed classes (sand, mud, spur and groove, individual and aggregated patch reef, aggregate reef, scattered coral/rock in unconsolidated sediment, pavement, rock/boulder (volcanic and carbonate), reef rubble, pavement with sand channels, artificial, and unknown).



Unconsolidated Sediment

Sand
Coarse sediment typically found in areas exposed to currents or wave energy.

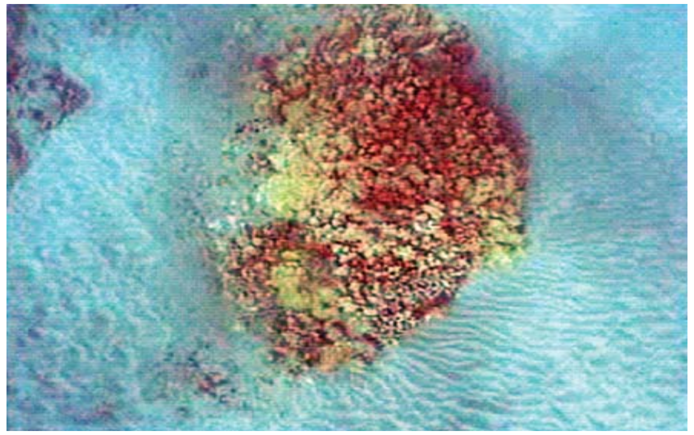
Mud
Fine sediment often associated with river discharge and build-up of organic material in areas sheltered from high-energy waves and currents.

Coral Reef & Hardbottom

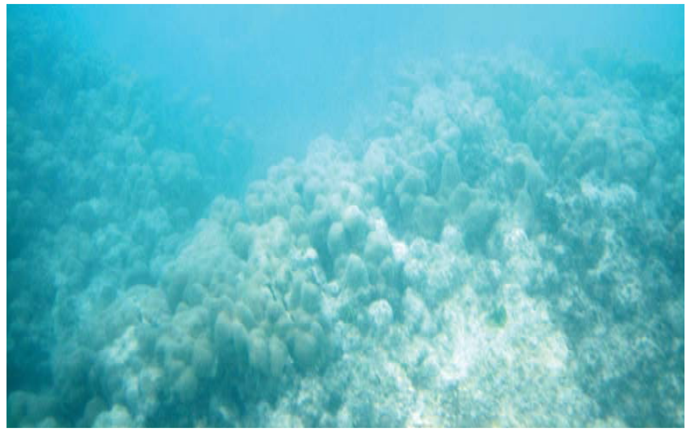
Spur and Groove
Habitat having alternating sand and coral formations that are oriented perpendicular to the shore or bank/shelf escarpment. The coral formations (spurs) of this feature typically have a high vertical relief relative to pavement with sand channels (see below) and are separated from each other by 1-5 meters of sand or hardbottom (grooves), although the height and width of these elements may vary considerably. This habitat type typically occurs in the fore reef or bank/shelf escarpment zone.

Patch Reef
Coral formations that are isolated from other coral reef formations by sand, seagrass, or other habitats and that have no organized structural axis relative to the contours of the shore or shelf edge.

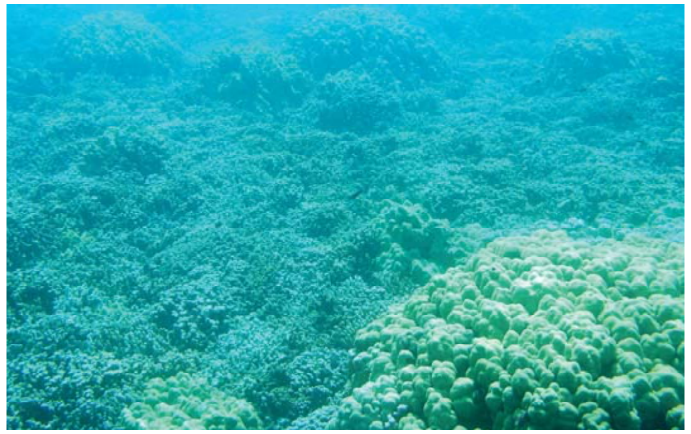
Individual Patch Reef Distinctive single patch reefs that are larger than or equal to the MMU.



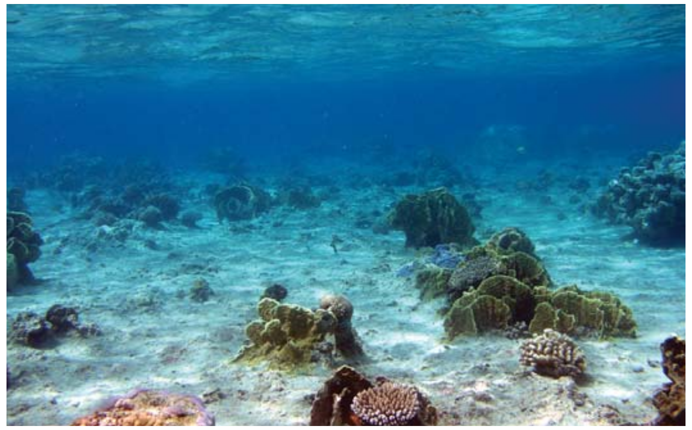
Aggregate Patch Reefs Clustered patch reefs that individually are too small (less than the MMU) or are too close together to map separately.



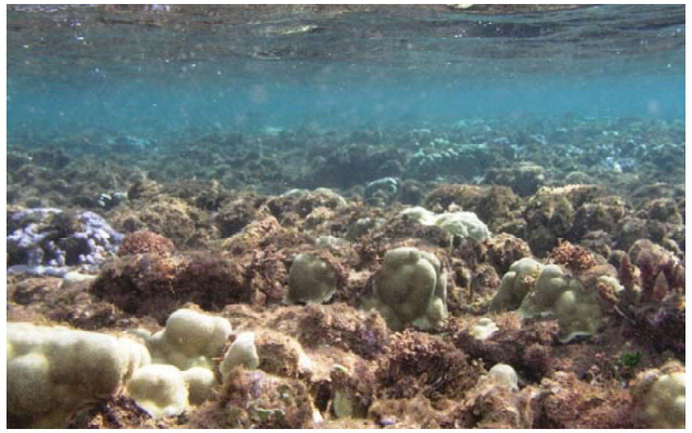
Aggregate Reef
High relief lacking sand channels of spur and groove.



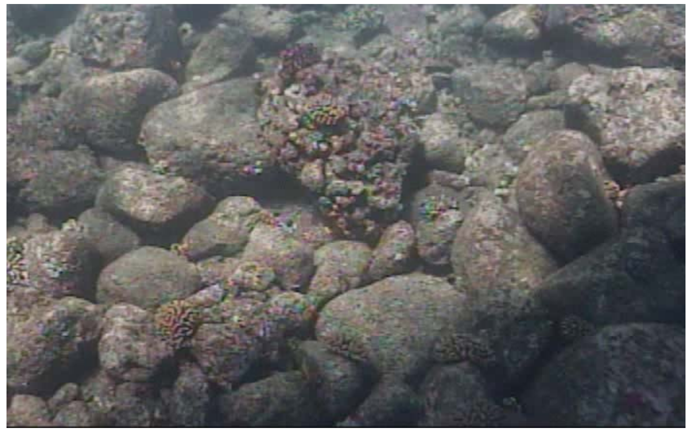
Scattered Coral/Rock in Unconsolidated Sediment
Primarily sand or seagrass bottom with scattered rocks or small, isolated coral heads that are too small to be delineated individually (i.e. smaller than individual patch reef).



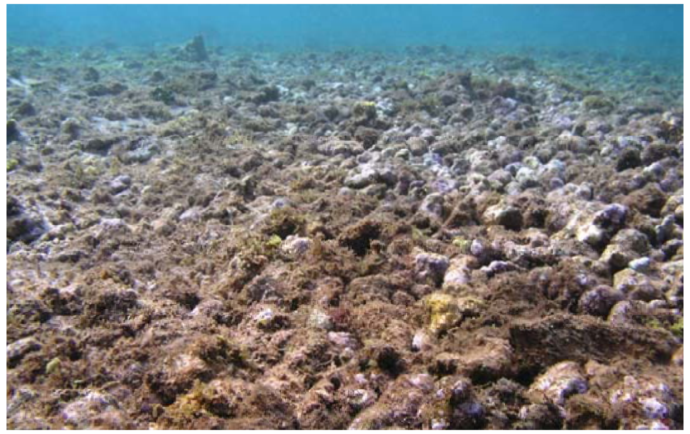
Pavement
Flat, low-relief, solid carbonate rock with coverage of macroalgae, hard coral, zoanthids, and other sessile invertebrates that are dense enough to begin to obscure the underlying surface.



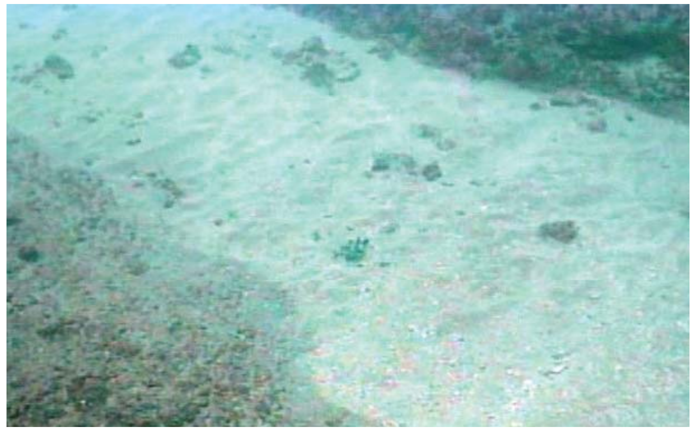
Rock/Boulder
Solid carbonate blocks and/or boulders or volcanic rock.



Reef Rubble
Dead, unstable coral rubble often colonized with filamentous or other macroalgae. This habitat often occurs landward of well developed reef formations in the reef crest or back reef zone.



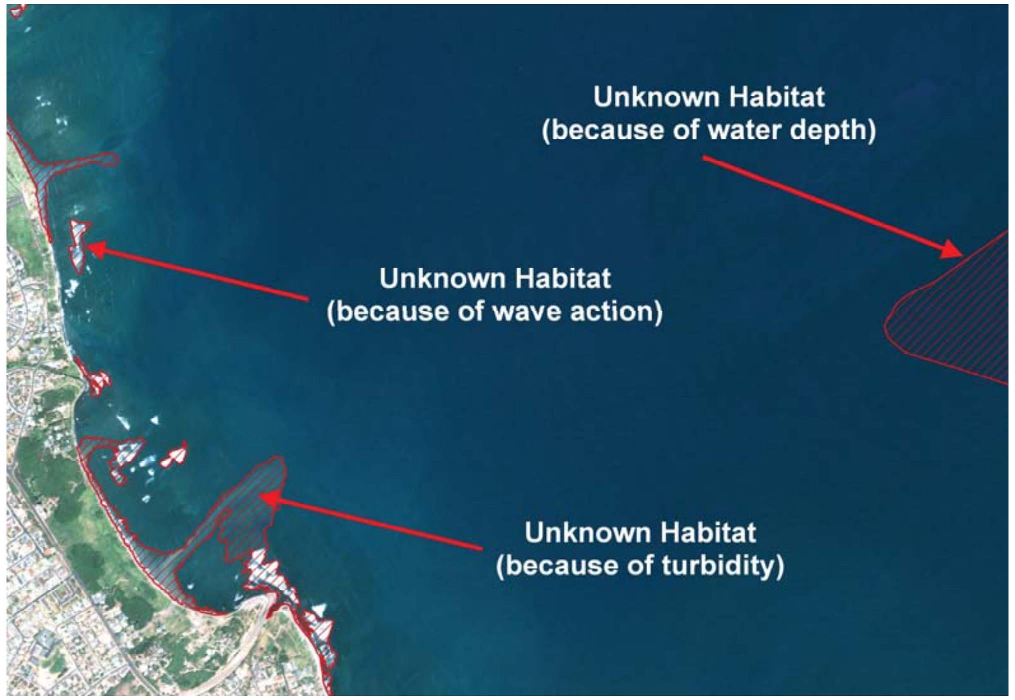
Pavement with Sand Channels
Habitats of pavement with alternating sand/surge channel formations that are oriented perpendicular to the shore or bank/shelf escarpment. The sand/surge channels of this feature have low vertical relief relative to spur and groove formations and are typically erosional in origin. This habitat type occurs in areas exposed to moderate wave surge such as the bank/shelf zone.



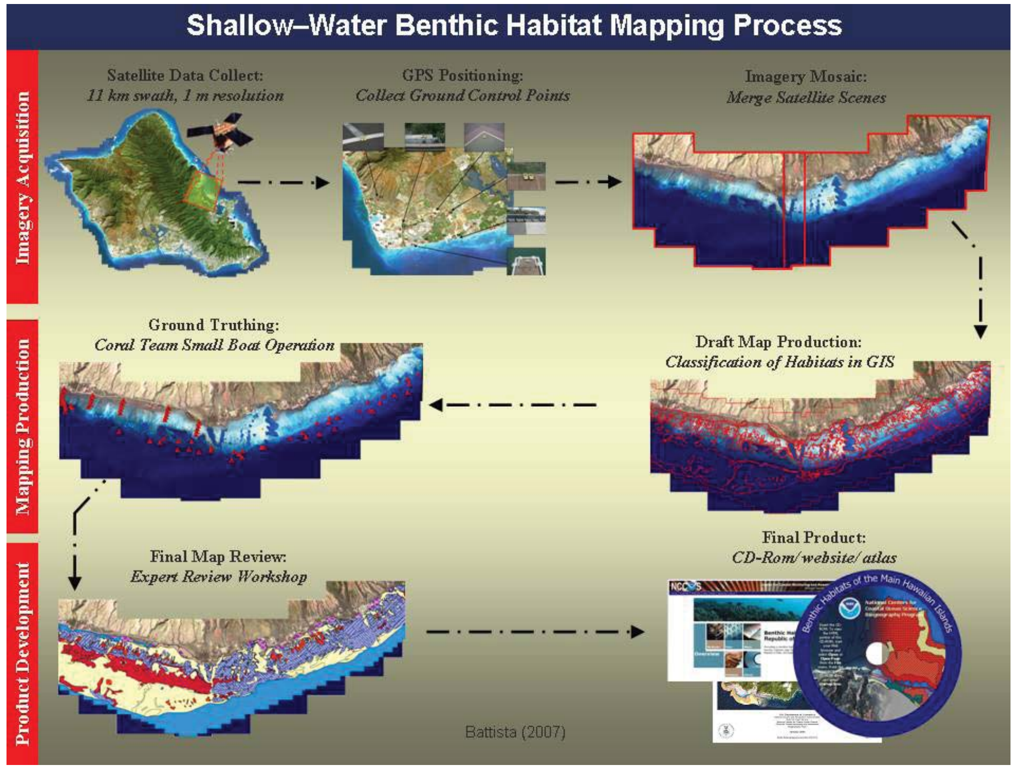
Other Delineations Artificial
Man-made habitats such as submerged wrecks, large piers, submerged portions of rip-rap jetties, and the shoreline of islands created from dredge spoil. Includes active and remnant fish ponds walled off from the open ocean along the shoreline, often along a reef crest.

Land
Terrestrial features above the spring high tide line.

Unknown
Zone, Cover, and Structure uninterpretable due to turbidity, cloud cover, water depth, or other interference.


Unknown Habitat
(because of water depth)
Unknown Habitat
(because of wave action)
Unknown Habitat
(because of turbidity)

Methods: Product Development


Shallow–Water Benthic Habitat Mapping Process
Imagery Acquisition
Mapping Production
Product Development
Satellite Data Collect:
11 km swath, 1 m resolution
GPS Positioning:
Collect Ground Control Points
Imagery Mosaic:
Merge Satellite Scenes
Ground Truthing:
Coral Team Small Boat Operation
Draft Map Production:
Classification of Habitats in GIS
Final Map Review:
Expert Review Workshop
Final Product:
CD-Rom/website/atlas
Benthic Habitats of the Main Hawaiian Islands
Battista (2007)

Creating Digital Orthophotographs

Introduction

Satellite imagery is a valuable tool for natural resource managers and researchers since they provide an excellent record of the location and extent of habitats. Benthic habitat maps of the Republic of Palau were created through visual interpretation of multispectral IKONOS™ and Quickbird™ imagery using the NOAA Habitat Digitizer extension. Habitat boundaries were delineated around signatures (e.g., areas with specific color and texture patterns) in the orthorectified imagery mosaic corresponding to habitat types in the Classification Scheme. The custom Habitat Digitizer extension was used, digitizing at a scale of 1:6,000 with a 1-acre minimum mapping unit. Generally, feature detection of seafloor habitats was possible from the shoreline to water depths of approximately 30 meters, depending on water clarity. In order to optimize the satellite imagery for visual interpretation, a number of processing steps were implemented to enhance the geopositioning and clarity of the imagery. These steps include: orthorectification to remove spatial distortions in the imagery due to relief displacement; pansharpening; deglinting; and generating normalized reflectance values.

Satellite Imagery

Multispectral IKONOS ™ and Quickbird ™ satellite imagery, from Space Imaging Inc. and Digital Globe respectively, was used for creating all maps. IKONOS imagery was 11-bitprecision and included both pan-chromatic and multispectral four-band data. The IKONO Satellite orbits the Earth every 98 minutes at an altitude of approximately 680 kilometers or 423 miles. IKONOS is in a sun-synchronous orbit, passing a given longitude at about the same local time (10:30 A.M.) daily and can produce 1-meter imagery of the same geography every 3 days. The Satellite sensor elevation angle, the angle from horizon to sensor as seen from the area of interest (AOI), is typically > 60°. Swath size for a single scene is 11 km x 11 km. Information on IKONOS was taken from the Space Imaging website (http://www.spaceimaging.com).

Quickbird imagery had similar characteristics to IKONOS, 11-bit precision pan-chromatic band and four-band multispectral, but has slightly higher ground resolution and increased blue signal in the panchromatic band. The Quickbird satellite orbits every 93.4 minutes at an altitude of 450 km with a 98 degree, sun-synchronous inclination. Views are revisited with a frequency of 3-7 days depending on latitude at 60-cm resolution and viewing angle can be changed for in-track and cross-track pointing. Swath size for a single scene is 16.5 km x 16.5 km. Information about Quickbird data from the Digital Globe website: http://www.digitalglobe.com/downloads.

Band centers, ground resolution and calibration coefficients for IKONOS and Quickbird are shown below in Table 1 and Table 2 respectively. Radiometric calibration was done by multiplying raw imagery in digital units (DN) by the calibration factor and then dividing by the spectral bandwidth. Imagery received from Space Imaging was evaluated for quality before any processing commenced; any raw data containing undesirable environmental features, such as excessive glint, cloud cover, or other factors that obscured bottom features, were rejected.

Table 1. IKONOS satellite data characteristics (post 2/22/01)

Band	**λ center (nm)**	**λ range (nm)**	**Resolution (m)**	**Radiometric Cal Factor DN*cm2*sr/mW**
Pan	727	525.8 - 928.5	1	Not used
Blue	480	444.7 - 516.0	4	728
Green	551	506.4 - 595.0	4	727
Red	665	631.9 - 697.7	4	949
NIR	805	757.3 - 852.7	4	843

Table 2. Quickbird satellite data characteristics

Band	**λ center (nm)**	**λ range (nm)**	**Resolution (m)**	**Radiometric Cal Factor DN*cm^2*sr/mW**
Pan	675	450 - 900	1	Not used
Blue	485	450 - 520	2	623
Green	560	520 - 600	2	695
Red	660	630 - 690	2	789
NIR	830	760 - 900	2	648

Image Evaluation

The initial imagery evaluation centered around one main criterion; “Is the bottom visible?” After the satisfaction of the technical and quantifiable parameters were verified, each image was deemed either acceptable or not based mainly on whether bottom features were visible between the shoreline and the 30 meter isobath. The first group of quantified parameters could be confirmed by the imagery metadata, those parameters were:

- Elevation angle no less that 68° and no more than 85°
- Horizontal Accuracy: 5 m CE95 (see Section 4.3-4.4)
- Projection/Datum: UTM NAD83
- Units: meters
- Bits per pixel: 11-Bit
- No greater than 20% cloud cover for any given scene
- Acquisition date no later than 2 years prior to first acquisition date for any given area

Each image was required to meet certain spatial parameters as well:

- Area of Interest (AOI) must be completely filled by imagery
- No significant overlap with previously accepted and mapped imagery

Furthermore, each acceptable image was required to meet certain spectral quality criteria:

- Deep water pixels must approximately match the expected deep water spectra
- Shallow water pixels must approximately match the expected shallow water spectra
- Vegetation pixels must approximately match the expected vegetation spectra
- Glint must not obstruct entire bottom regions - small amount of glint acceptable

After an image had met the more quantifiable criteria, it could then be qualitatively evaluated based bottom visibility. Overall, the main obstruction of the bottom was suspended sediment but white caps, white wash, foam, and breaking waves also caused visibility issues. Images that were not pristine but deemed marginally acceptable were evaluated to estimate the percentage of usable imagery. The area of obstructed bottom (be it from sediment, waves, clouds, etc.) was converted to a shape file and subtracted from the total mapping area of that image. If the unusable area was 10% or less of the total, the image was acceptable. Another consideration made regarding marginal imagery was the likelihood of getting better data over the same area at a later time due to the calm nature of winter waves and weather patterns.

Data Conditioning Methods

Data Processing Overview

The image processing scheme was developed by BAE Systems Spectral Solutions such that atmospherically corrected, calibrated data in units of remote sensing reflectance could be produced and then used with the ArcGIS Coral Reef Digitizer Extension software developed by NOS. The main components of the scheme were atmospheric correction and deglinting (Fig. 1).

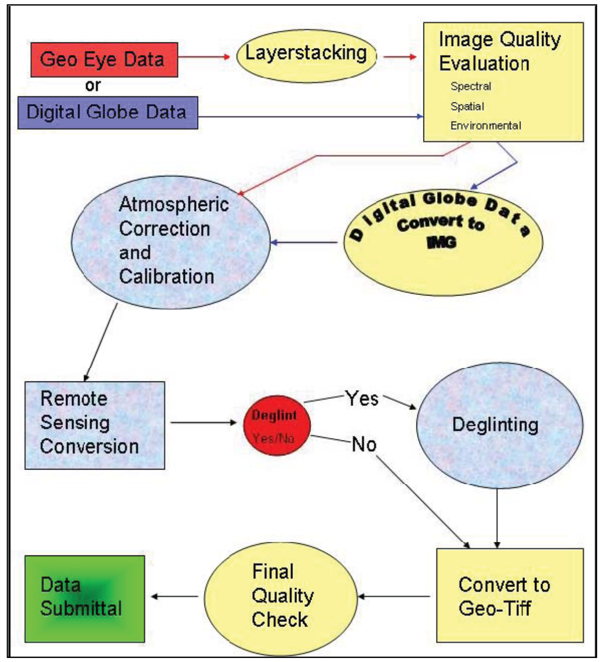


Figure 1. Image processing flowchart for IKONOS and Quickbird data

Atmospheric Correction

Once the imagery was evaluated for overall quality, it was processed for mapping using the program ATCOR2™, an atmospheric correction software plugin for ERDAS IMAGINE PRO V.8.7 (Leica Geosystems Geospatial Imaging, LLC.) that corrects for aerosols and water vapor and outputs a radiometrically corrected image in reflectance units. Some key steps for using ATCOR2 are shown below.

1. The Solar Zenith value in ATCOR2 is the angle of the sun off-nadir. Space Imaging, however, reported the sun elevation (i.e., the angle of the sun from horizon). Thus, we calculated the solar zenith angle following equation 1:

Solar Zenith (degrees) = 90 – Sun Angle Elevation Eq (1)

Where the sun angle elevation was provided by Space Imaging in the metadata files.

2. The tilt angle pertains to the angle of the sensor off-nadir. Space Imaging reported the sensor tilt angle as Nominal Collection Elevation in degrees from the horizon. We calculated the angle by Equation 2.

Tilt Angle (degrees) = 90 – Nominal Collection Elevation Eq (2)

Where the nominal collection elevation was provided by Space Imaging’s metadata. Unfortunately, the only tilt angles considered in ATCOR2 for this option were 10, 20, and 30 degrees. The calculated tilt angle was rounded to the closest default angle (e.g., if the tilt angle was 17°, the closest default angle was rounded to 20°).

3. The direction (N, S, E, W) to select for this option was determined by the relative azimuth between the nominal collection azimuth of the sensor and the solar azimuth, calculated using Equation 3.

Relative Azimuth = | Nominal Collection Azimuth – Solar Azimuth | Eq (3)

A relative azimuth of 0° = S, 30° = E, 120° = N, 150° = W. All other angles were rounded to the nearest defined angle to determine the direction (e.g., if the relative azimuth was 130°, the closest defined angle was 120° so the direction would be assigned as N).

4. Aerosol type was selected as “midlat_summer_marit”

5. Haze removal was not performed before correction as the function only worked over land and caused problems over water.

6. Output reflectance files were in percent, multiplied by a scale factor (normally 10) and saved in integer format. To get remote sensing reflectance (upwelling radiance / downwelling irradiance), the data needed to be divided by (pi*scale factor*100), resulting in units of per-steradian (sr-1). Example spectra are shown in Figure 2.

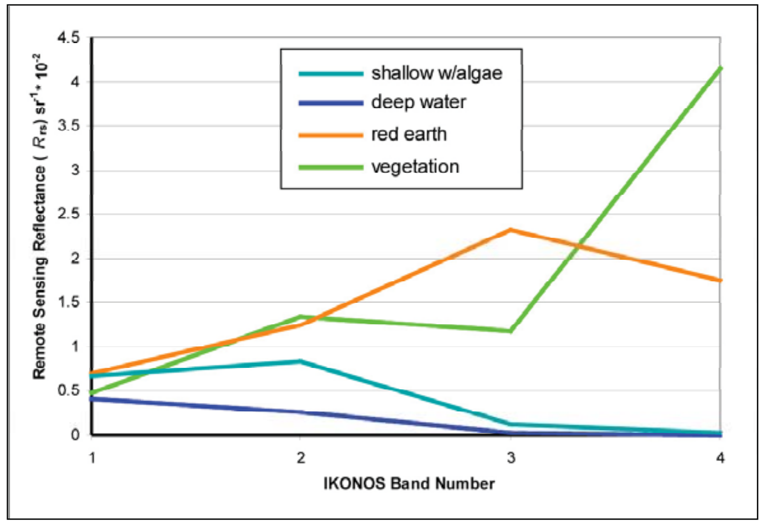
Figure 2. Example remote sensing reflectance spectra of seafloor and ground cover.

Pan Sharpening

The purpose of pan-sharpening was to spectrally sharpen low spatial resolution image data with high spatial resolution image data. The 4-band color low-resolution (4 m) multispectral (MSI) IKONOS imagery was merged with the high-resolution (1 m) single-band grayscale panchromatic IKONOS imagery, with nearest neighbor resampling to the high-resolution pixel size. The pan sharpening process was carried out by Geo Eye and Digital Globe for their data respectively.

An issue noted with the pansharpened files was that they may not appear as sharp as the 4 m spatial resolution MSI image before processing. This was a result of the slight temporal difference (sometimes up to ½ second) between the MSI image and panchromatic images, an issue known to Space Imaging but not fixed during the contract period. The detail (i.e., resolution) of the output file, however, should look much more refined after this process.

During orthorectification, digital imagery is subjected to algorithms that eliminate each source of spatial distortion. The result is a georeferenced digital mosaic of several imagery scenes with uniform scale throughout the mosaic.



After an orthorectified mosaic is created, visual interpreters can accurately and reliably delineate the boundaries of features in the imagery as they appear on the computer monitor using a software interface such as the Habitat Digitizer. Through this process, natural resources managers and researchers are provided with spatially accurate maps of habitats and other features visible in the imagery.

Glint Removal

Images with moderate amounts of glint were corrected using an automated glint-removal algorithm written in Matlab and utilized the differences in the near-infrared band to distinguish glint from water, land, and the seafloor. The idea behind the code is that pixels will have a variable fraction of specular reflection caused by the angle of wavelets in relation to the sun. The fraction is proportional to the amount of signal in the near-infrared (NIR) band, which would benegligible in the ocean (Hochberg et al. 2003).

In order to calculate the amount of glint, pixels in the image were segmented based on thresholds of NIR to find those with the highest signal. Land, vegetation and very shallow water often had a high NIR value also and were masked out of glint calculations using a band ratio threshold of NIR verses blue. The glint pixels were averaged and the minimum value of the remaining "background" pixels (not glint, land, vegetation, shallow water) were subtracted to get a glint spectrum. The amount of glint in each pixel was calculated using the NIR band by first subtracting the "background" pixel NIR value, then dividing by the glint NIR value. Glint was removed from all bands by subtracting the glint spectrum in all bands scaled by the ratio of glint in the NIR.

The deglinting procedure was carried out with atmospherically corrected MSI and pansharpened data, and only with images that had glint pixels that would hinder the visibility of bottom features. Pansharpening the image after deglinting the four-band multispectral image would result in reintroduction of glint, so deglinting was always the last step. A problem with deglinting pansharpened data was that some spectral artifacts were introduced by the pan-sharpening and the algorithm needed hand-tuning to remove these artifacts.

Deglinting Process

In order to calculate the amount of glint, pixels with the highest 5% of NIR signal were segmented into the "glint subset". Land, vegetation and very shallow water often had a high NIR signal also and were masked out of glint calculations using band ratio thresholds. Pixels with zeros in all bands, created during image mosaicking, were masked as well. See Glint Removal Algorithms Section in Project Completion Report: Mapping of Benthic Habitats for the Main Hawaiian Islands for more details on this topic.

Final Imagery Mosaics

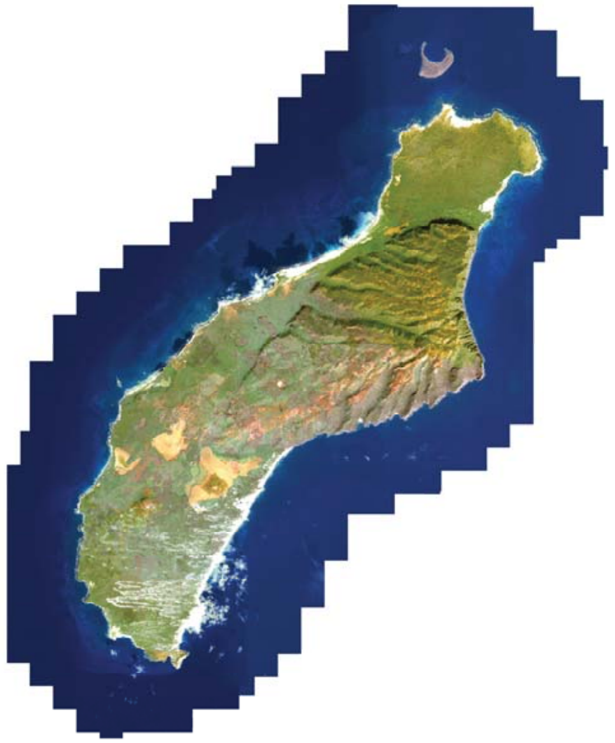
Final mosaics were created in "tif" file format (georeferenced image file) with the following projection parameters Universal Transverse Mercator (UTM) Zone 5 North, North American Datum (NAD) 83 for the island of Hawaii, and UTM Zone 4 North, NAD 83 for the islands of Maui, Kahoolawe, Lanai, Molokai, Oahu, Kauai, Niihau and Kaula. These were created by fusing imagery collected for this project over open water with cloud free LANDSAT terrestrial imagery.

These files are available on the Shallow-Water Benthic Habitats of the Main Hawaiian Islands DVD and at the NOAA's Biogeography Program Web site.

Interpreting Digital Orthophotographs

Digitizing Benthic Habitats

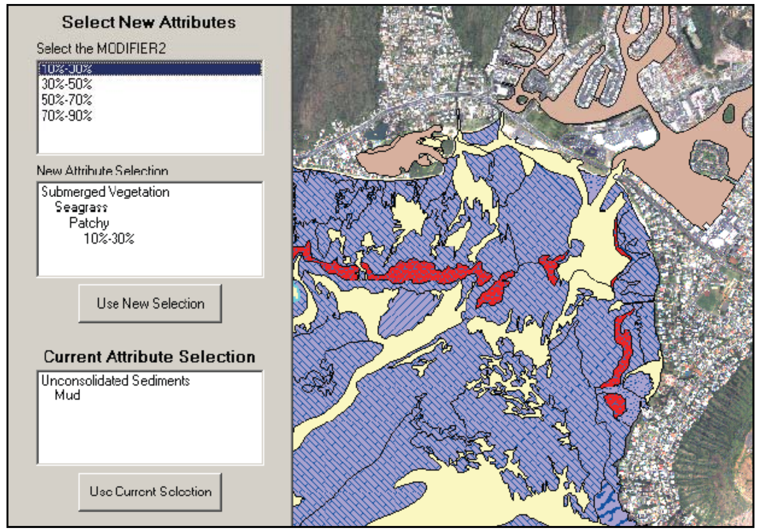
Individual georeferenced mosaics were loaded into ArcGIS with the Habitat Digitizer and Effects toolbars activated. The ArcGIS Effects toolbar allows each image to be easily manipulated so as to optimally adjust contrast, brightness, and color. The Minimum Mapping Unit (MMU) restriction was set to 1 acre in the Habitat Digitizer extension. One acre was selected based on the scale of the imagery and the objectives of the mapping project. As a result, some features visible in the imagery such as small isolated patch reefs and sea walls that, while important features, are quite small and beyond the scope of this mapping project.



Digitizing scale was set to 1:6000 in the Habitat Digitizer. Experimentation indicated that digitizing at this scale optimizes the trade-off between positional accuracy of lines and time spent digitizing. In general, line placement conducted while zoomed in at large scales results in excellent line accuracy and detail but can be quite time consuming. Conversely, while zoomed out, lines can be drawn quickly but lack both detail and positional accuracy.

Determining the Optimum Digitizing Scale

Results of an experiment conducted during benthic habitat mapping of the Caribbean were used to determine the optimum digitizing scale to maximize accuracy and minimize map production time. In the Caribbean digitizing experiment a 25 acre area composed of a variety of habitat types was mapped at 1:1500, 1:3000, 1:6000, and 1:12,000 on-screen scale (scale that the image appears on the computer monitor). Five replicates were conducted at each scale. Each trial was timed so we could evaluate the influence of mapping scale on production time. Resulting maps were evaluated for deviations in polygon detail relative to the map digitized at 1:1500 scale. At 1:1500, individual pixels are clearly discernible allowing highly detailed and accurate maps to be created by closely following the contours of even the most convoluted habitat boundary. Additional increases in zoom do not result in an increase in map detail and accuracy since individual pixels are already visible at 1:1500. Therefore, the map created at 1:1500 scale was used as a reference against which to compare maps digitized at scales of 1:3000, 1:6000, and 1:12,000.



10%-30%
30%-50%
50%-70%
70%-90%

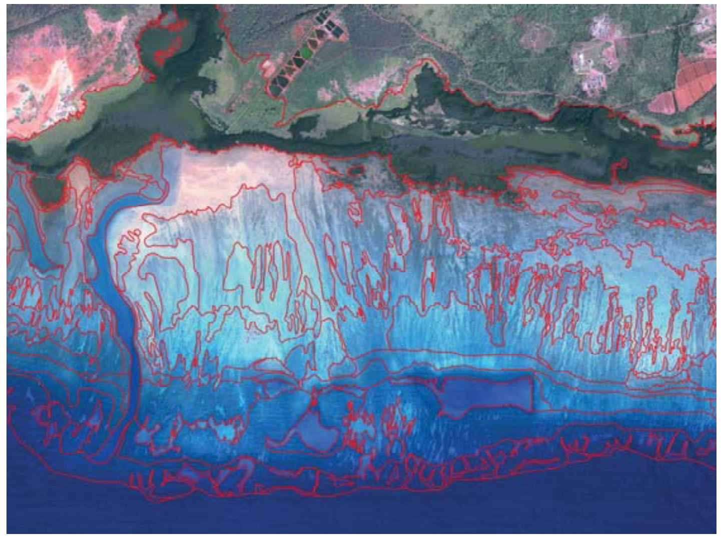
New Attribute Selection

Submerged Vegetation
Seagrass
Patchy
10%-30%

Current Attribute Selection

Unconsolidated Sediments
Mud

The results of this experiment indicated that there is no appreciable loss in polygon detail and accuracy by digitizing at 1:6000 while mapping time was dramatically reduced. Therefore all polygons were digitized at this scale except when subtle habitat boundaries were not easily discernible at 1:6000 and zooming out to a more broad scale was required to place boundaries correctly. In this case, digitizing generally took place at a scale of approximately 1:10,000.



Using the Habitat Digitizer, habitat boundaries were delineated around signatures (e.g., areas with specific color and texture patterns) in the orthorectified mosaic corresponding to habitat types in the Classification Scheme. This was often accomplished by first digitizing a large boundary polygon such as the habitats that compose the shoreline and then appending new polygons to the initial polygon or splitting out smaller polygons within. Each new polygon was attributed with the appropriate habitat designation according to the classification scheme. It is believed that the positional accuracy of polygon boundaries is similar to that of the mosaics since delineation is performed directly on the digital imagery. Brightness, contrast, and occasionally color balance of the mosaic were manipulated to enhance the interpretability of some subtle features and boundaries. This was particularly helpful in deeper water where differences in color and texture between adjacent features tend to be more subtle and boundaries more difficult to detect. Particular caution was used when interpretation was performed from altered images, since results from color and brightness manipulations can sometimes be misleading.

The visual interpreter was provided a series of imagery files to aid in delineating and attributing polygons. These included the unmodified multispectral scenes (4m), normalized reflectance scenes (4m), and pansharpened multispectral scenes (1m).

Field Survey Methodology

Ground Validation

Following careful evaluation of the IKONOS imagery, and in some cases creation of a "first draft" habitat map through the process outlined in the previous section, selected sites were visited in the field for typological validation.

This validation included:

1. Areas in the imagery with confusing or difficult to interpret signatures
2. Transects across many representative habitat types occurring in different depths and water conditions
3. A survey of the zones
4. Confirmation of preliminary habitat delineations if a first draft was produced

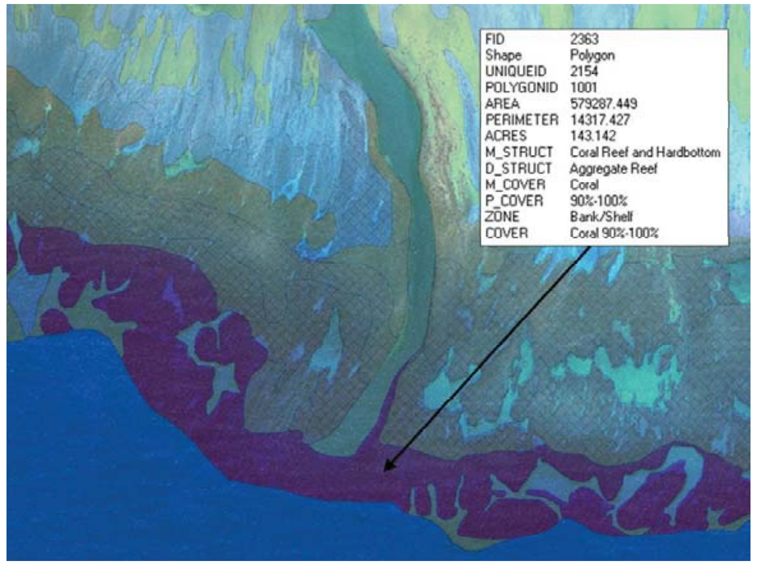
Navigating to field sites was accomplished in a variety of ways including:

- Uploading position coordinates from the mosaic into an onboard GPS and navigating to those waypoints
- Using an onboard PC connected to GPS allowing navigation using digital nautical charts or the mosaic
- Visual navigation using landmarks visible in the imagery

On most occasions, field activities were conducted with the guidance of local experts. IKONOS imagery, and when available, draft delineations were used in the field to facilitate comparison of signatures in the imagery to actual habitats at each site. Individual sites were visually evaluated by snorkeling and free diving or directly from the boat in shallow, clear water. Habitat transitions were evaluated by swimming transects across habitat types to further guide placement of polygon boundaries.

Habitat type(s), zone, approximate depth, position (GPS), image number, and other descriptive information were recorded at each site. Field data for each site was then compiled into a text table with a latitude/longitude field to allow overlay of the field information on the mosaic and habitat polygons (Ground Validation Points). Where depth and water clarity permitted, the IKONOS imagery were used to navigate across multiple bottom features allowing continuous confirmation of habitat types and transitions between each site.

Once the field data was processed, polygon boundaries and habitat classifications were created or revised where necessary, and zone attributes were assigned to each polygon using the Habitat Digitizer. This draft of the habitat maps was then reviewed and revised with the guidance of a panel of local experts at peer review sessions held on Oahu, Maui and Hawaii. Review session participants included members of the local research and management community.



FID	2363
Shape	Polygon
UNIQUEID	2154
POLYGONID	1001
AREA	579287.449
PERIMETER	14317.427
ACRES	143.142
M_STRUCT	Coral Reef and Hardbottom
D_STRUCT	Aggregate Reef
M_COVER	Coral
P_COVER	90%-100%
ZONE	Bank/Shelf
COVER	Coral 90%-100%

During these peer review sessions, particular attention was given to polygons labeled as "unknown" and areas not visited during ground truth activities. Revisions based on comments from local experts were then completed and final habitat maps were produced. Thematic accuracy was assessed for these final maps (see Assessment of Classification Accuracy).

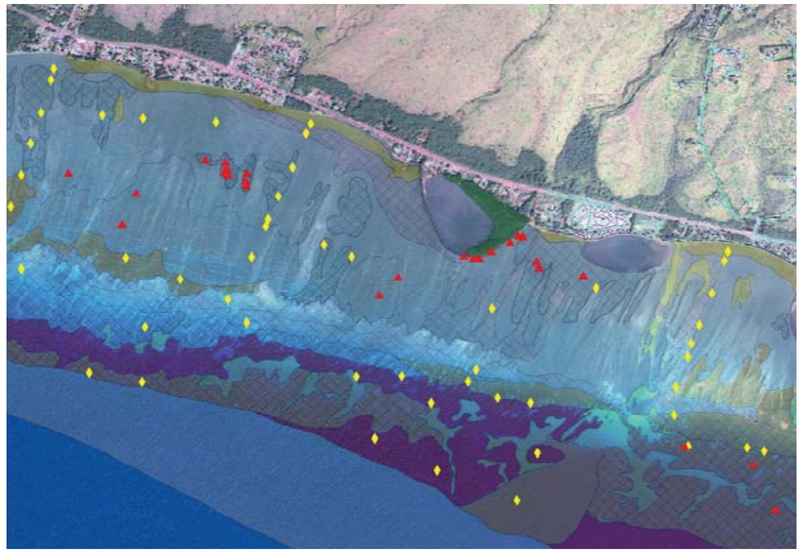
Evaluating Thematic Accuracy

The quality of the habitat information derived from remotely sensed data is determined by the quantitative process of accuracy assessment. The purpose of accuracy assessment is to identify and quantify errors in the maps by comparing the attributes of the map versus reference data at various sites. It is important that the mapmaker know how reliably a given habitat can be classified. This parameter is called "producers accuracy". The users of a map product want to know what percentage of the polygons of a particular class are correctly attributed. This parameter is called "users accuracy". Furthermore, remotely sensed imagery that may be suitable for mapping coral reef habitats can be acquired from a wide variety of platforms and imaging systems, each having their own strengths and limitations. It is important to identify the technical merits of each, one measure of which is the thematic accuracy of the map products.

To determine the overall accuracy of the mapped product, GIS data prepared by visually interpreting IKONOS satellite imagery was assessed for accuracy using conventional methodologies. It was proposed that specific areas being mapped be used as test areas for this work. A statistically robust data set composed of random field habitat observations were collected within the test areas to assess the accuracy of the mapped product. These areas were chosen based on input from the local marine biologists and coral reef managers. These groups provided advice on the location of the most diverse benthic communities and also areas of particular importance based on management strategies and marine protected areas. Thus, it was the goal of this team to collect accuracy assessment field data representing as many of the habitats that occur in these regions as possible.
The thematic accuracy of all mapped products was determined at the most general and detailed levels of the classification scheme including both the biological cover type and geomorphological structure. Eight coral reef test areas were selected based on the diversity of the habitat types and to assure that all benthic habitats throughout the main Hawaiian Islands were represented. The accuracy of all maps is, therefore, considered a conservative representation of the thematic accuracy of the habitat maps prepared using the same methods.

Thematic Accuracy in the Main Hawaiian Islands

An accuracy assessment system was designed and executed to quantify the thematic accuracy of the maps generated at all levels of the classification scheme. Statistical analysis methods have been applied that have been developed by other researchers (Hudson and Ramm 1987, Congalton 1991, Rosenfield et al. 1982). In this work, 20 to 30 field habitat observations were completed per detailed structure as well as detailed biological cover type. The accuracy assessment is prepared from a matrix that compares the attribute assigned to a polygon that was generated from the interpretation of the image with that of the determination from field observation.



Eight test areas were selected for the main Hawaiian Islands: Oahu (Kailua, Lanikai, Waimanalo, and Kahala), southern Molokai,Lanai (east Lanai and Manele Bay), Maui (Oluwalu and Ahihikina’u), and Hawaii (Keahole). Careful consideration was taken to select areas that constituted as comprehensive a representation of the habitats and exposure regimes in the Hawaiian archipelago as possible.

Benthic habitat maps from these areas were generated from IKONOS™ and Quickbird™ satellite imagery collected at 4 and 2.44 meter resolution and pansharpened to 1 and 0.61 meter resolution, respectively. All image interpretation and digitizing was conducted by a single NOAA contractor. The field habitat characterization data collection methods for thematic accuracy assessment differed little from the data collected for ground validation. The primary distinction between the two data sets was the method of selection of the field points. Where as the assessment sites for ground validation were selected to specifically investigate habitat types and gradients of spectral signatures in the imagery, a random stratified sampling method was implemented to select field sites to test map accuracy (Congalton 1991).

Subsequent to completion of the second draft coral reef habitat maps, waypoints were generated using a stratified random sampling scheme. Twenty to thirty accuracy assessment waypoints were collected per test area for each detailed structure and detailed cover class encountered. Waypoint files were generated from these points and all waypoints that could be safely accessed were navigated to using a Trimble Geo Explorer 3 GPS data logger. Upon arriving at the waypoint, an underwater camera was lowered until its weight system touched the bottom, at which point the camera was released, capturing the profile of the bottom before being pulled to the surface.. After deployment of the camera, 100 GPS positions were collected at one-second intervals and were averaged to generate a single position.

Data including but not limited to site ID, depth, most common habitat, zone and assessment method were recorded using the GPS data logger equipped with a custom data dictionary designed to meet the specifications of the Coral Reef Habitat Classification Scheme. At the end of each field day, the data were downloaded, differentially corrected to the closest CORS station and seamlessly converted to ArcGIS format. All hand written descriptions were entered in waterproof notebooks and transferred to the GIS by hand. A total of 671 benthic habitat characterizations were completed in across the eight accuracy assessment areas combined.

To maintain objectivity in the analysis of accuracy, an independent team conducted this work. The Coral Reef Assessment and Monitoring Program (CRAMP) biologists from the Hawaii Institute of Marine Biology from the University of Hawaii at Manoa made the official judgments. The accuracy assessment point theme and the benthic habitat polygon themes were overlaid on the imagery in the GIS. The GIS was queried to select all points within the polygons that matched the polygon habitat type. These were set aside as correct calls. The mismatched pairs were closely examined.

The classification errors that occurred between the MMU and size of accuracy assessment areas were accounted for in this analysis. A map classification was not considered incorrect in a case where a seven meter radius field assessment fell on a habitat feature in the field that was smaller than 1 acre. For example, if a field assessment fell on a small patch reef surrounded by sand that was less than the MMU and thus was not mapped, the point was excluded from the accuracy assessment report. Points that fell close to polygon boundaries were all included as it was assumed that the probability of error contributing to false negatives would be equal to that for false positives. The habitat type for the portions of the test area that were not interpretable due to cloud cover, glint or water quality were classified as “unknown”. The accuracy assessment points that fell within polygons with the habitat type of “unknown” were not included in the accuracy analysis.

Results of Overall Accuracy Assessment of Benthic Habitat Map Products

Thematic accuracy of the benthic habitat maps was determined using the aforementioned methods. The mapped habitat type was compared with that of the actual habitat type from field observation. The data is organized into columns representing the field habitat assessment and the rows organized into mapped habitat type. The correct class for each of the incorrect attributes was recorded and included in a comprehensive matrix at the most detailed level of the classification scheme. Four of these detailed matrices were generated, one each for biological cover and geomorphological structure. Error matrices were prepared at the detailed and general levels to identify patterns of confusion in the interpretation of the signatures in the imagery. This information was incorporated into ongoing work to improve the accuracy of mapped product. A complete description of these results can be found in the final project report, Project Completion Report: Mapping of Benthic Habitats for the Main Hawaiian Islands.

Traditionally, the data is organized into columns that represent the field habitat validation data and the rows are organized into the interpretation of the images. The overall accuracy is typically measured by dividing the total correct determinations by the total number of assessments. This result only incorporates the major diagonal of the table and excludes the omission and commission errors whereas the Tau analysis indirectly incorporates the off-diagonal elements as a product of the row and column marginals. Furthermore, the Tau analysis compensates for unequal probabilities of groups or for differences in numbers of groups (Ma and Redmond 1995). This assessment lends itself to statistical analysis wherein the photointerpreter’s determination is assigned a probability that it occurred at random (see Tables 3-5).

Table 3. Coral reef habitat thematic content summary of zone classes in Hawaii.

Zone	Polygons	Area (km^2)	Perimeter (km)	% of Total Benthic Habitats
Backreef	56	10	186	1%
Bank/Shelf	3,556	1,005	13,391	75%
Bank/Shelf Escarpment	43	3	150	0%
Channel	216	24	509	2%
Dredged	127	38	368	3%
Forereef	407	78	1,359	6%
Lagoon	95	19	185	1%
Land	1,992	16,652	2,621	n/a
Reef Crest	379	14	527	1%
Reef Flat	1,614	135	3,449	10%
Reef Hole	87	4	103	0%
Shoreline Intertidal	81	7	176	0%
Unclassified	6	0	5	0%
Unknown	94	6	167	0%
Total (including land)	8,753	17,993	23,199	

Table 4. Coral reef habitat thematic content summary of biological cover classes in Hawaii.

Major Cover	Detailed Cover	Polygons	Area (km²)	Perimeter (km)	% of Total Benthic Habitats
Live Coral	10%-<50%	830	258	3,379	19%
	50%-<90%	403	44	1,001	3%
	90%-100%	72	14	276	1%
Coralline Algae	10%-<50%	114	8	276	1%
	50%-<90%	55	2	65	0%
	90%-100%	0	0	0	0%
Emergent Vegetation	10%-<50%	12	0	20	0%
	50%-<90%	9	0	7	0%
	90%-100%	61	6	149	0%
Macroalgae	10%-<50%	789	253	2,911	19%
	50%-<90%	336	28	607	2%
	90%-100%	23	12	70	1%
Seagrass	10%-<50%	1	0	1	0%
	50%-<90%	0	0	0	0%
	90%-100%	0	0	0	0%
Turf	10%-<50%	364	39	738	3%
	50%-<90%	901	271	3,971	20%
	90%-100%	151	81	694	6%
Uncolonized	10%-<50%	0	0	0	0%
	50%-<90%	0	0	0	0%
	90%-100%	1,940	288	5,174	22%
Unknown	Unknown	584	34	1,151	3%
Unclassified	n/a	2,108	16,655	2,710	n/a
Total (including land)		8,753	17,994	23,199	

Table 5. Coral reef habitat thematic content summary of geomorphological structure classes of Hawaii.

Major Structure	Detailed Structure	Polygons	Area (km²)	Perimeter (km)	% of Total Benthic Habitats
Coral Reef and	Aggregate Reef	684	66	1,574	5%
	Aggregated Patch Reef	53	2	56	0%
	Individual Patch Reef	123	2	94	0%
	Pavement	1,723	436	5,611	32%
	Pavement with Sand Channels	105	74	568	5%
	Rock/Boulder	916	289	4,613	21%
	Rubble	102	3	137	0%
	Scattered Coral/Rock	88	4	144	0%
	Spur and Groove	109	40	555	3%
Other Delineations	Artificial	247	8	256	1%
	Land	1,861	16,647	2,454	n/a
Unconsolidated Sediment	Mud	211	63	733	5%
	Sand	1,947	324	5,252	24%
Unknown	Unknown	584	34	1,151	3%
Total (including land)		8,753	17,993	23,199	

Map Uses

Maps included in this atlas and the *Shallow-water Benthic Habitats of the Main Hawaiian Islands* (DVD) are tools with a wide variety of uses. One purpose of the maps was to provide a baseline inventory of the tropical shallow-water marine ecosystems of the U.S., specifically habitats that support coral reefs or are functionally connected to them, however, the resulting maps have applications beyond a baseline inventory.

As a stand-alone product, the maps themselves provide a wealth of information about the seascapes depicted in them. Attributes contained in the GIS shapefiles provide access to a broad range of spatial metrics and statistics. A few examples include: determining the spatial extent of each habitat (e.g., total area of dense macroalgae), determining the spatial extent of major classes (e.g., area of soft bottom habitats), and performing proximity analyses (e.g., finding sand within 20 m of a reef). They also provide a visual guide to the relative scarcity or abundance of particular habitat types. When used in conjunction with other data sets, the possibilities become much greater. Some potential applications are described below:

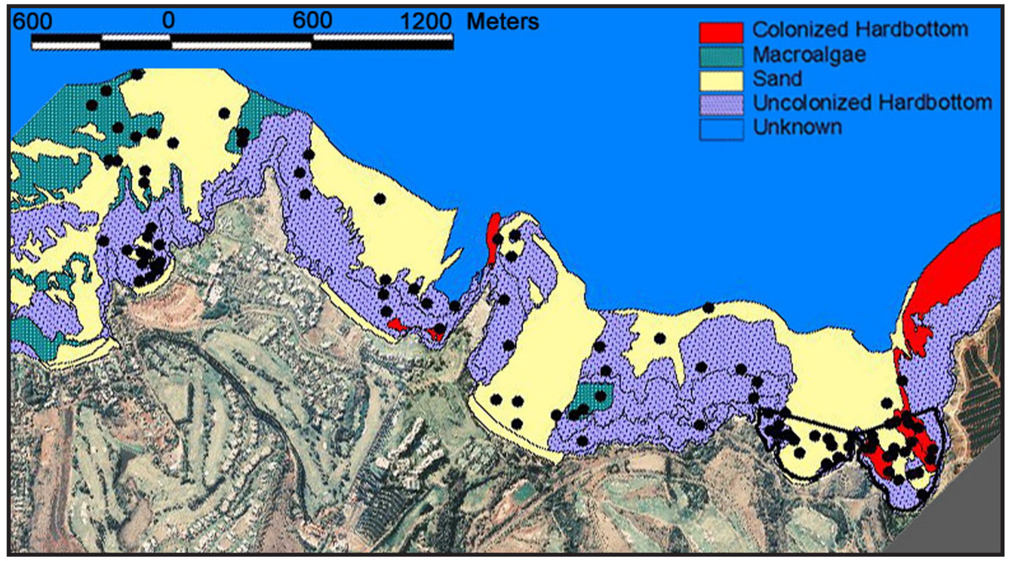


Figure 3. Random sampling points stratified by major habitat class and location inside/outside the Honolua-Mokuleia Marine Life Conservation District boundaries that were used by scientists for monitoring fish and benthic communities on the island of Maui in July and August 2002.

Scientific Applications

Maps and derived seascape metrics have been used extensively as a tool for monitoring tropical shallow-water marine ecosystems and the biological communities that exist there. The GIS maps enable researchers to design sampling strategies that support field operations (Figure 3; Friedlander and Brown 2003, Kendall et al. 2003). When combined with monitoring data such as fish censuses or water quality measurements, the maps allow for sophisticated spatially-explicit analyses (Monaco et al. 2001). Analysis of habitat maps in conjunction with information about biological community structure (derived from monitoring efforts) allows scientists to model and predict areas of biological importance (Figure 4; Christensen et al. 2003, Kendall et al. 2003).

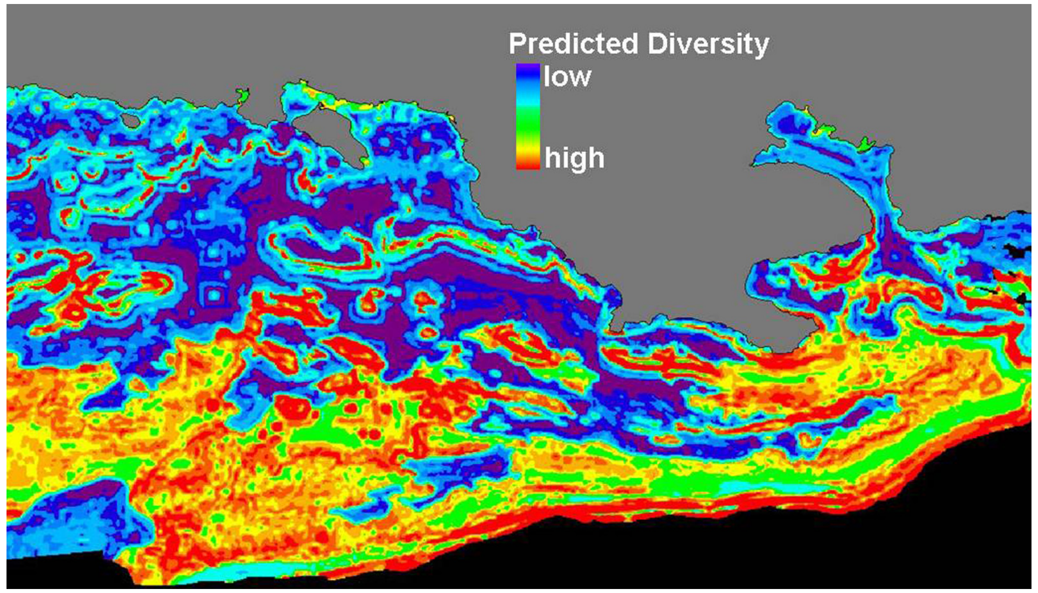


Figure 4. A map of the predicted diversity of fish species in Southwestern Puerto Rico, based on the habitat map developed for the area and fish census data collected by NOAA/ NOS scientists between 2000-2002.

Some scientists use the habitat maps as proxies in defining the distribution of species or groups that have specific habitat requirements. When used in combination with time-series data, the maps provide a mechanism for change detection. If habitat maps are combined with other environmental data layers and known species affinities, they can be instrumental in Habitat Suitability Modeling.

Planning and Management Applications

Coastal zone managers are often required to balance multiple and conflicting uses of the nearshore environment. Habitat maps can help managers identify areas that may be especially susceptible to damage from spills, vessel groundings, and other accidents. The maps also can be used in response planning and evaluating restoration activities in the event that marine resources are damaged, and can contribute to natural resource damage assessment activities. Managers may also use the maps to identify areas of special concern, such as in the case of habitats that sustain rare or threatened species. When used in conjunction with other biological and environmental data, such map products can help determine optimal locations for establishing networks of marine protected areas. The maps and associated data help ensure that the selected sites encompass areas of high biological importance and are representative of biological conditions. With the inclusion of oceanographic information, managers can identify sites that are effectively linked by prevailing currents, thereby preserving important ecological linkages. Habitat maps can help identify areas that are more or less suitable for a particular purpose. For example, similar benthic habitat maps in the Northwestern Hawaiian Islands are being used to support discussions on marine zoning throughout the Republic of Palau. They are also helpful in evaluating permit applications and identifying alternate locations for proposed marinas, dredging activities, sand mining and beach nourishment operations, and coastal access points. The maps may also contribute important contextual information about effects in the nearshore environment that stem from land use in adjacent coastal and upstream areas.

Other Applications

Members of the public have found the maps useful in a variety of ways as well. Recreational fishers benefit from knowing where particular habitat areas are located, especially if the target species has a particular habitat affinity. Commercial interests have used the habitat maps for siting aquaculture facilities in order to protect their equipment from damage and minimize the potential negative impacts associated with those operations. Other commercial ventures use habitat maps in conjunction with geologic maps to assess potential risk to proposed undersea cables or structures. Academics have used the digital map products in classes to teach students about the capabilities of Geographic Information Systems. Several graduate students have pursued projects or Ph.D. dissertations in the fields of fish biology or landscape ecology that utilize digital habitat maps developed by NOAA. One student project refined the habitat maps for marine protected areas along Hawaii's west coast to provide finer scale habitat information to managers.

It is important to note that these maps represent the best efforts of scientists, who are working within budget and time constraints, to communicate habitat information at a scale relevant to management. As such, we encourage map users to consider the current maps as a springboard for further development. We have provided all the necessary tools (IKONOS imagery, mosaics, the habitat digitizing extension to ArcGIS, a hierarchical classification scheme, shapefiles and legends that define areas by geomorphologic zone and habitat, etc.) to enable users to further refine the map products, such as by re-digitizing polygons from aerial photos viewed at a finer scale or by decreasing the size of the minimum mapping unit to capture even more detailed features. This has been accomplished by scientists working within National Park boundaries in the Caribbean and in Marine Life Conservation Districts in Hawaii, and resource managers in the U.S. Pacific Territories.

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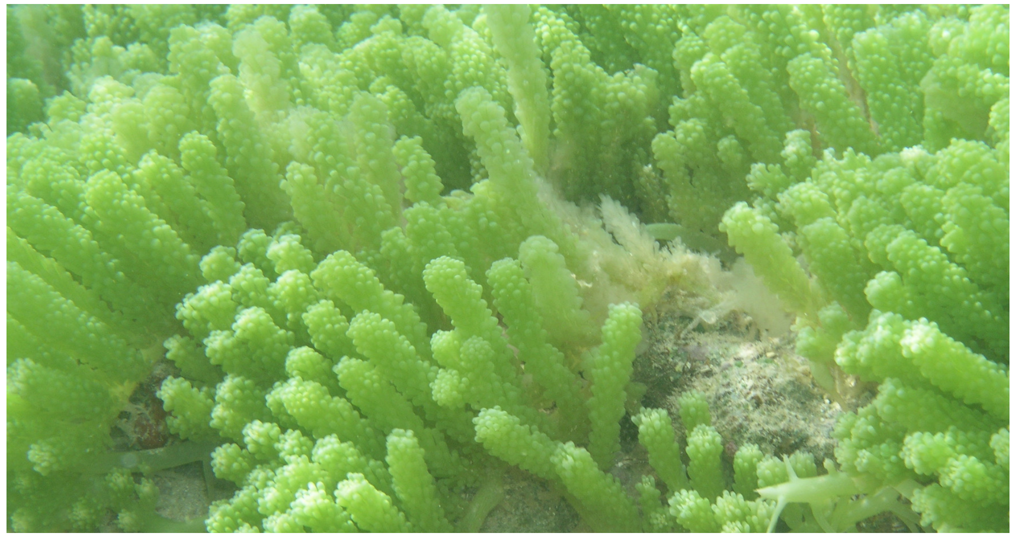

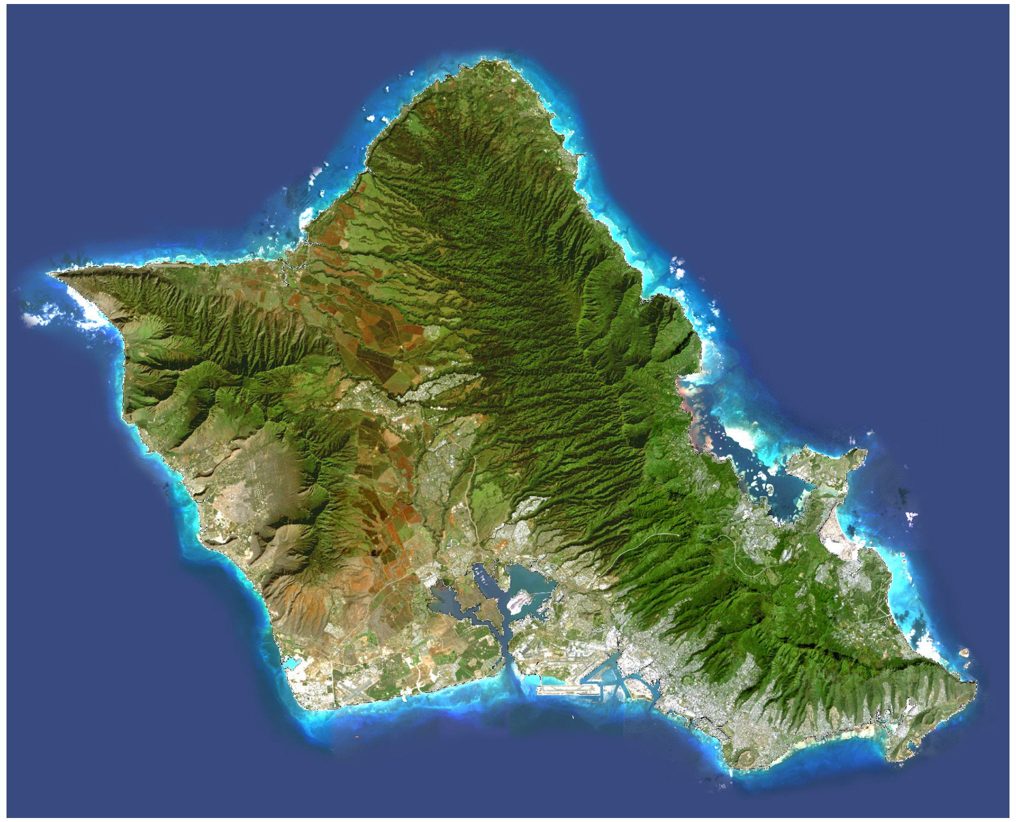

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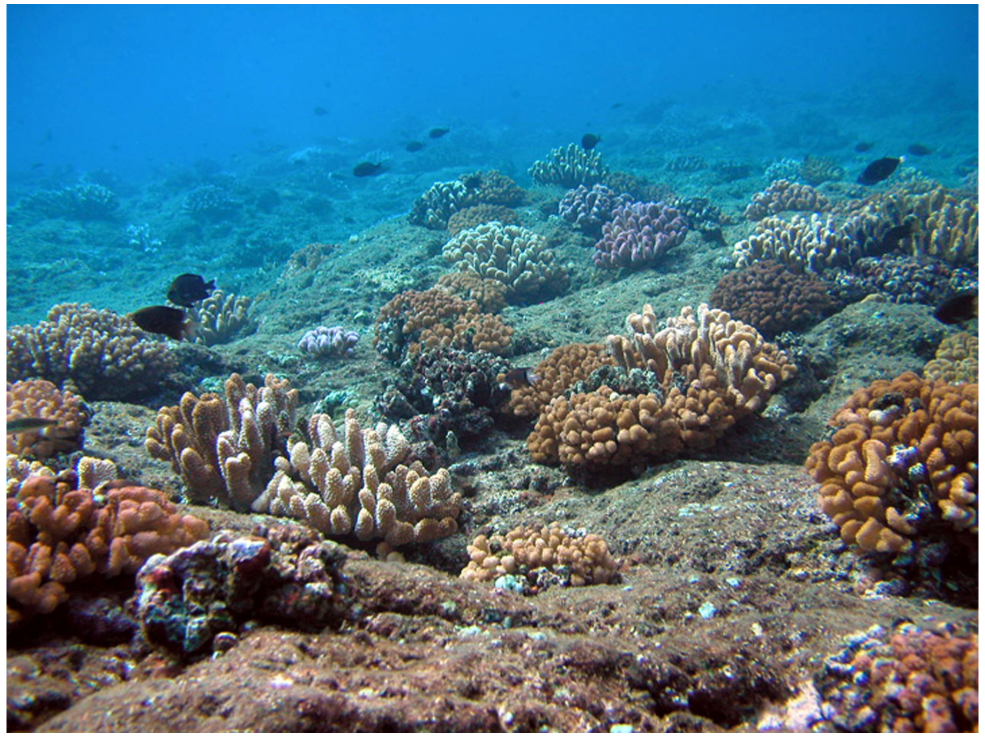
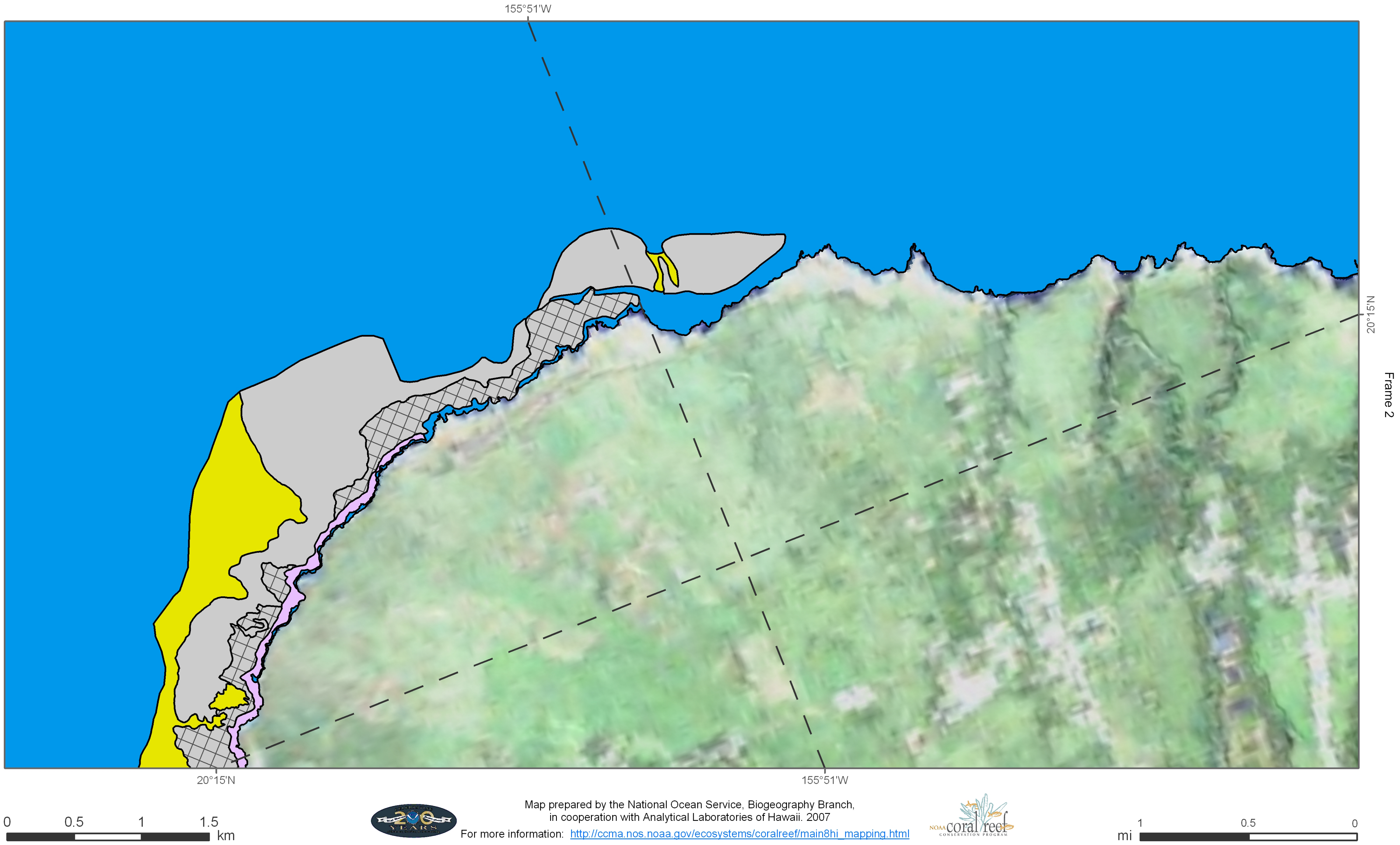
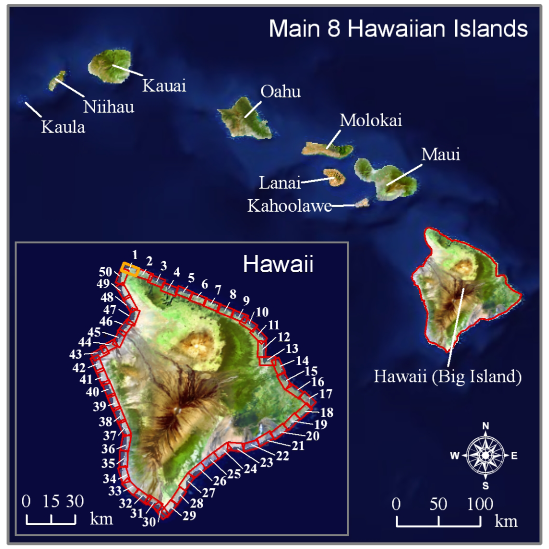


Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 1)


155°51'W
20°15'N
Frame 2
20°15'N
155°51'W
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
W
E
S

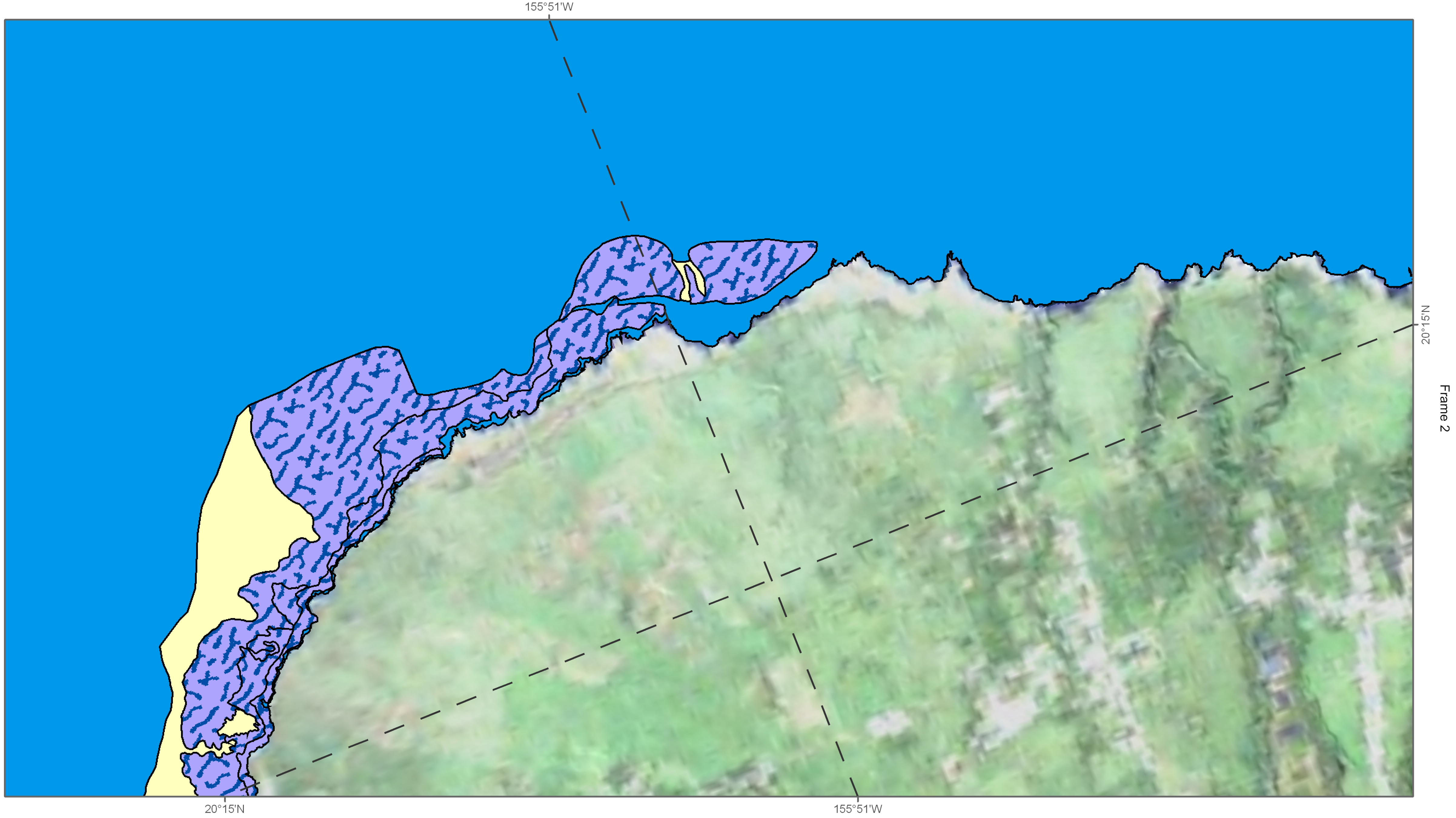
Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 1)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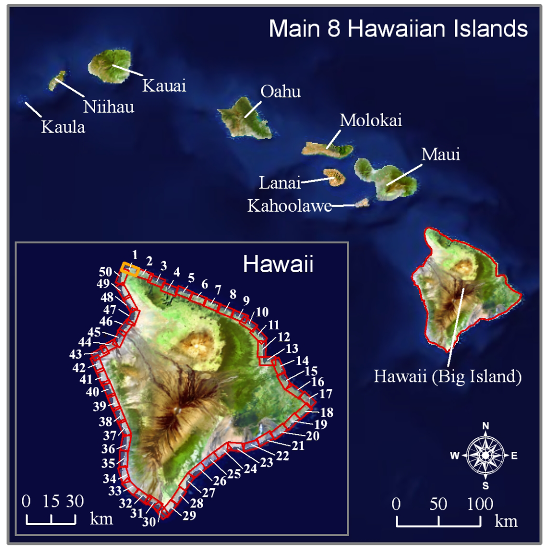
20°15'N
Frame 2
20°15'N
155°51'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
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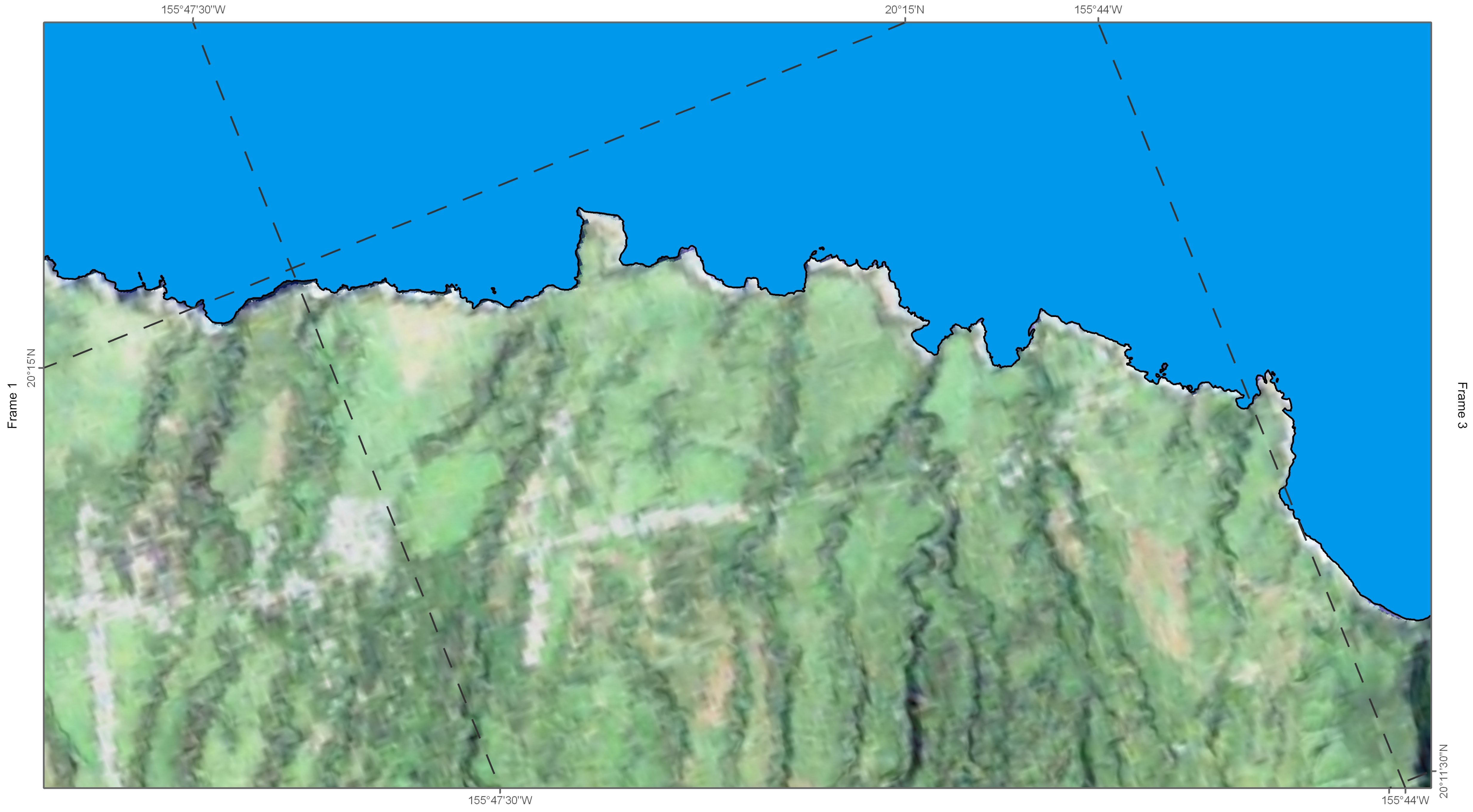
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi
1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 2)


155°47'30"W
20°15'N
155°44'W
Frame 1
20°15'N
Frame 3
20°11'30"N
155°47'30"W
155°44'W
0 0.5 1 1.5 km
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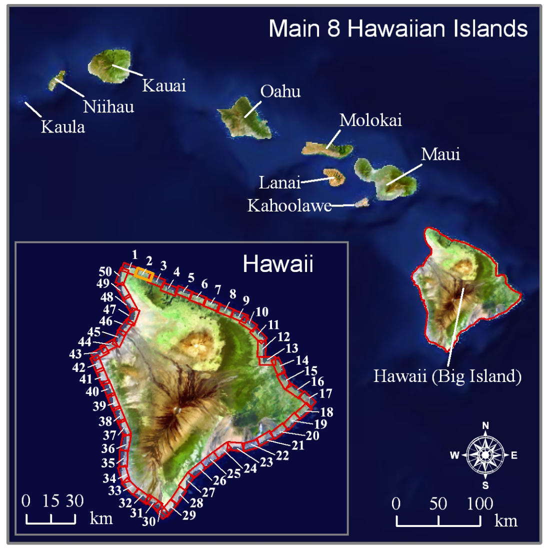
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ☐ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ☐ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ☐ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

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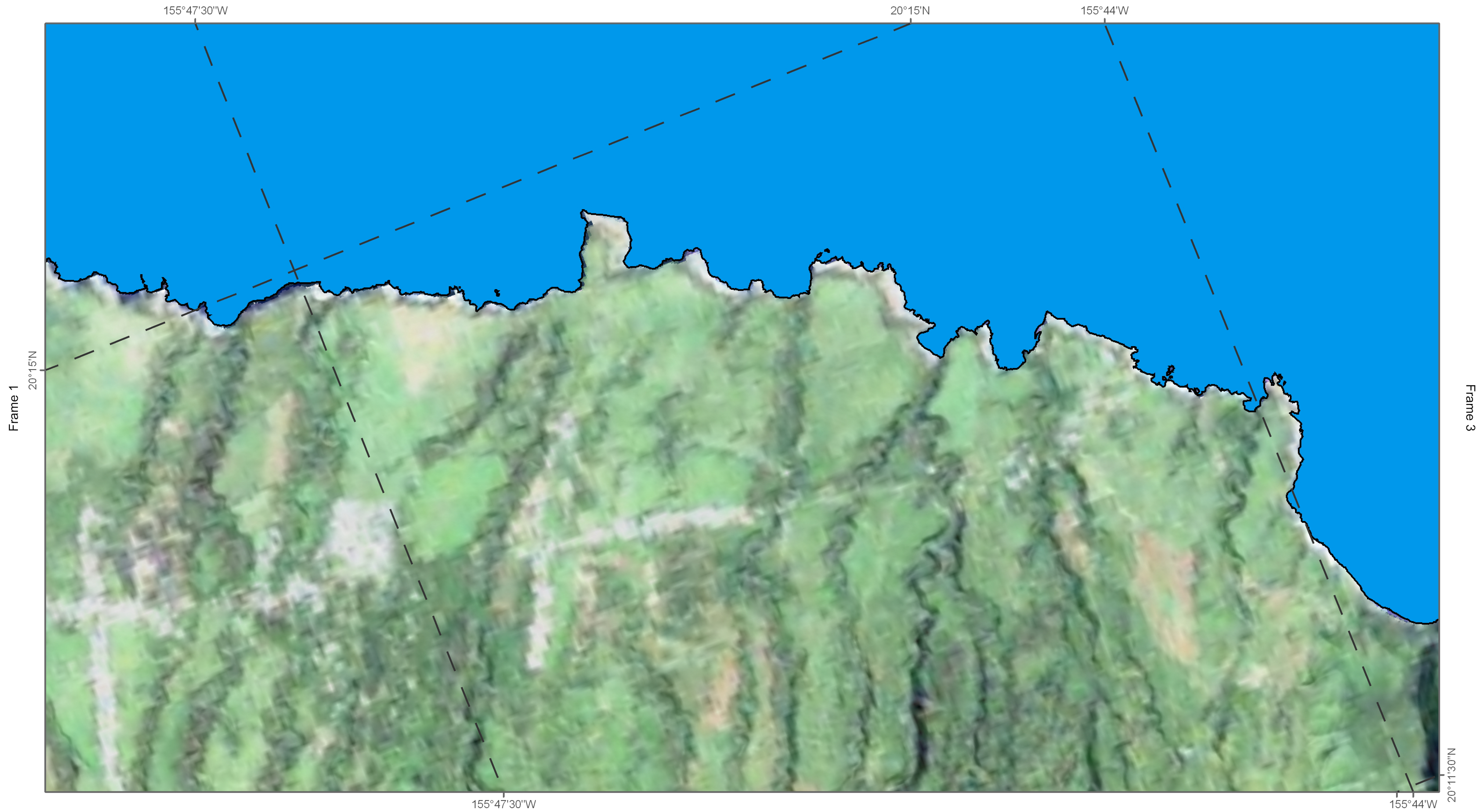
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 2)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Frame 1
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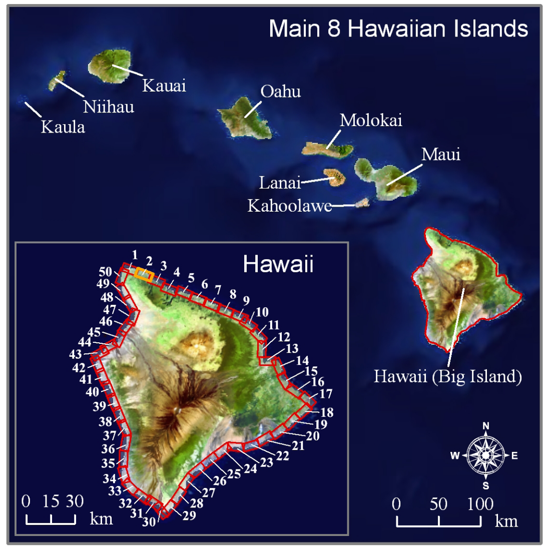
155°47'30"W
155°44'W
20°11'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

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For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

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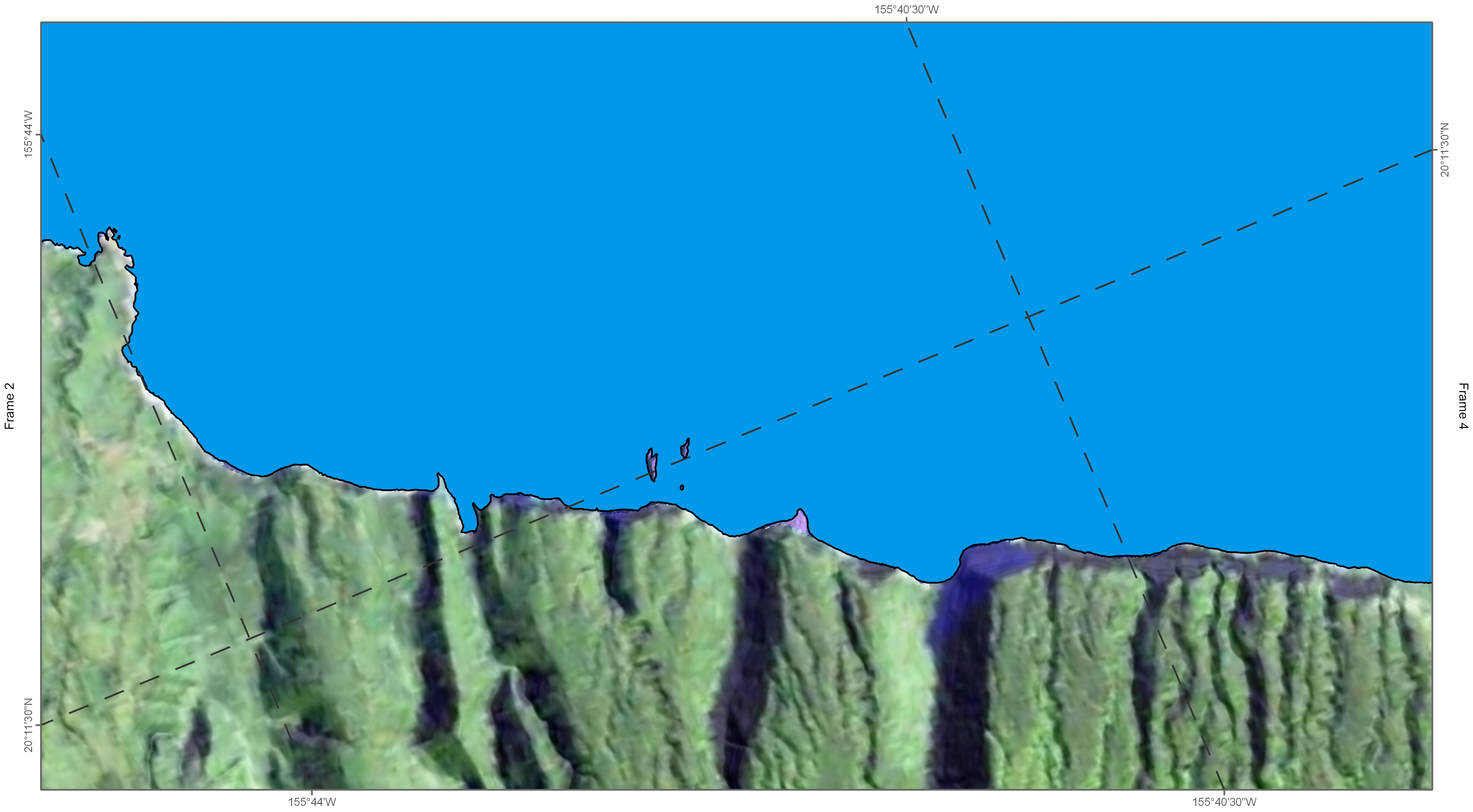
Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 3)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20°11'30"N
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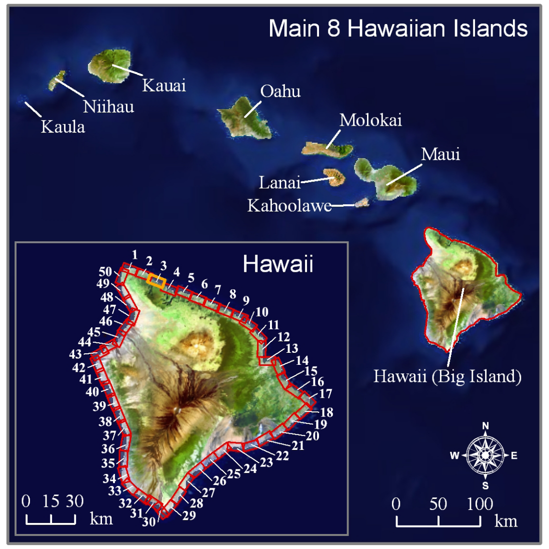
Frame 4
155°44'W
155°40'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ☐ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ☐ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ☐ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
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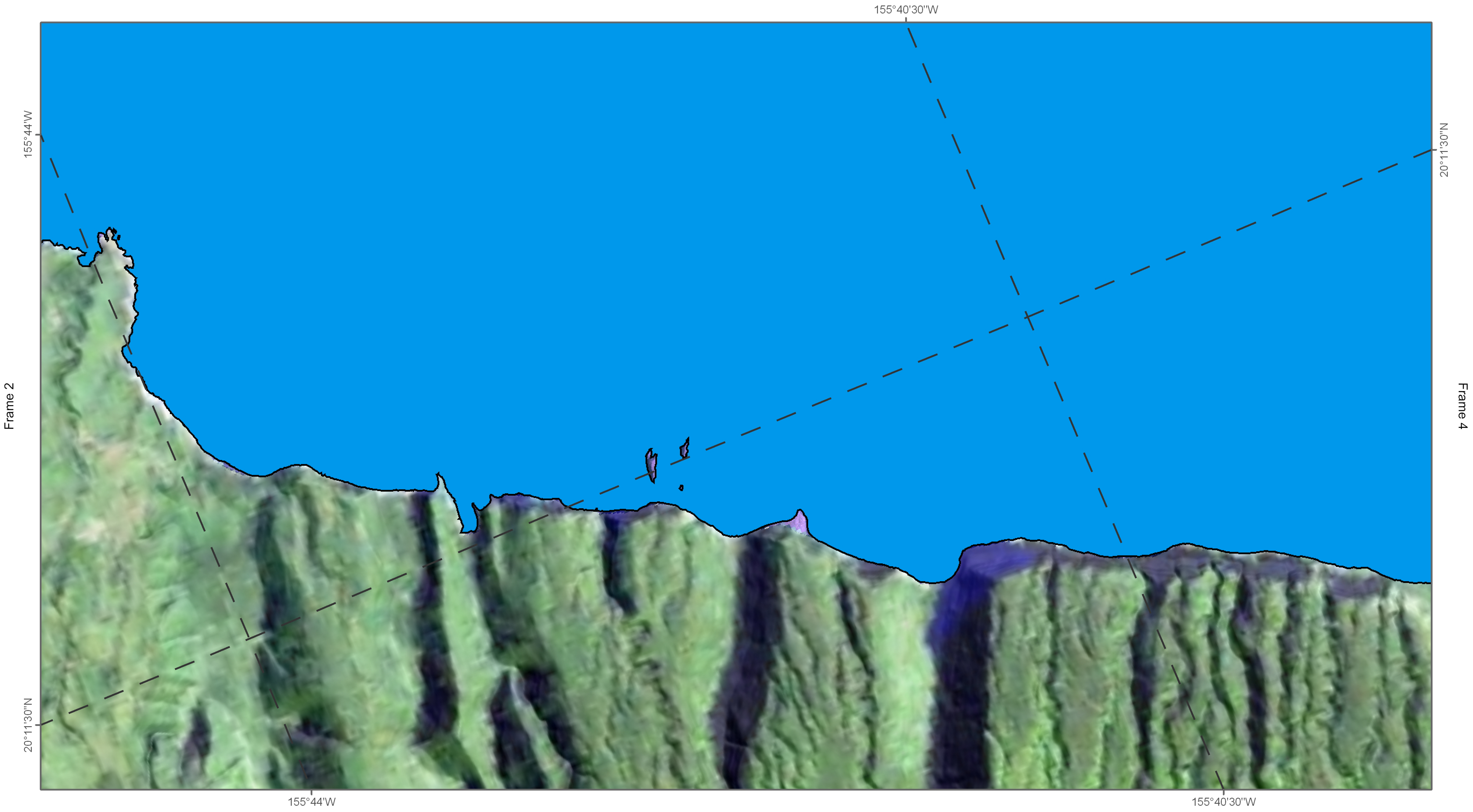
Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 3)


155°40'30"W
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Frame 4
20°11'30"N
155°44'W
155°40'30"W

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km
1 0.5 0
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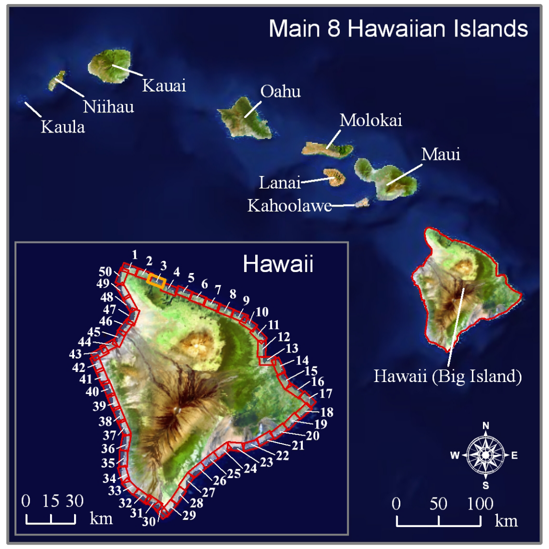
Main 8 Hawaiian Islands
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Molokai
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Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
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Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
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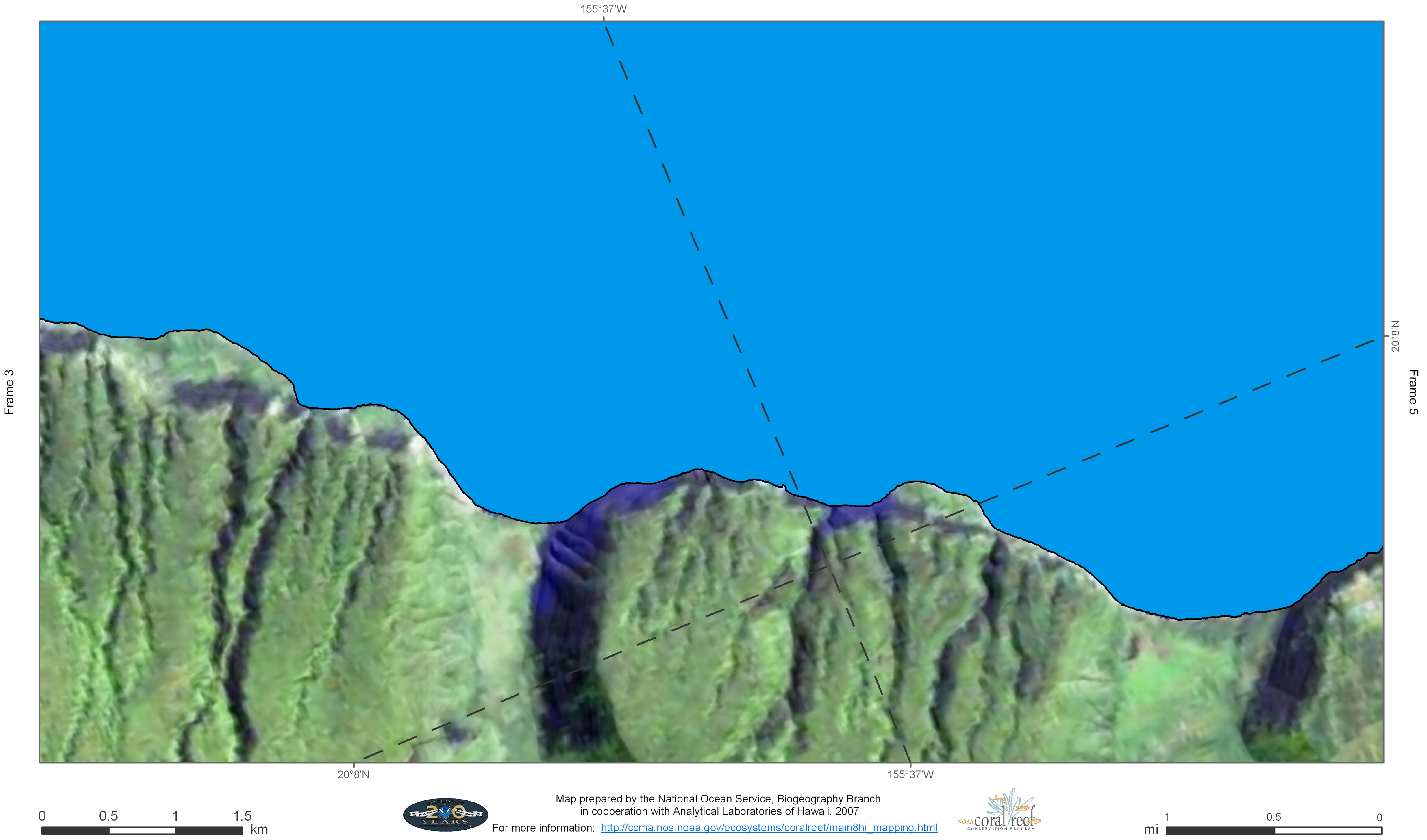
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 4)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Frame 3
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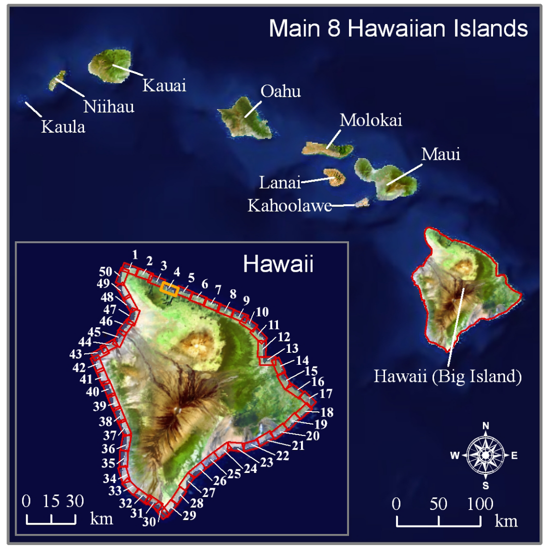
Frame 5
20°8'N
155°37'W
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▢ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▢ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▢ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

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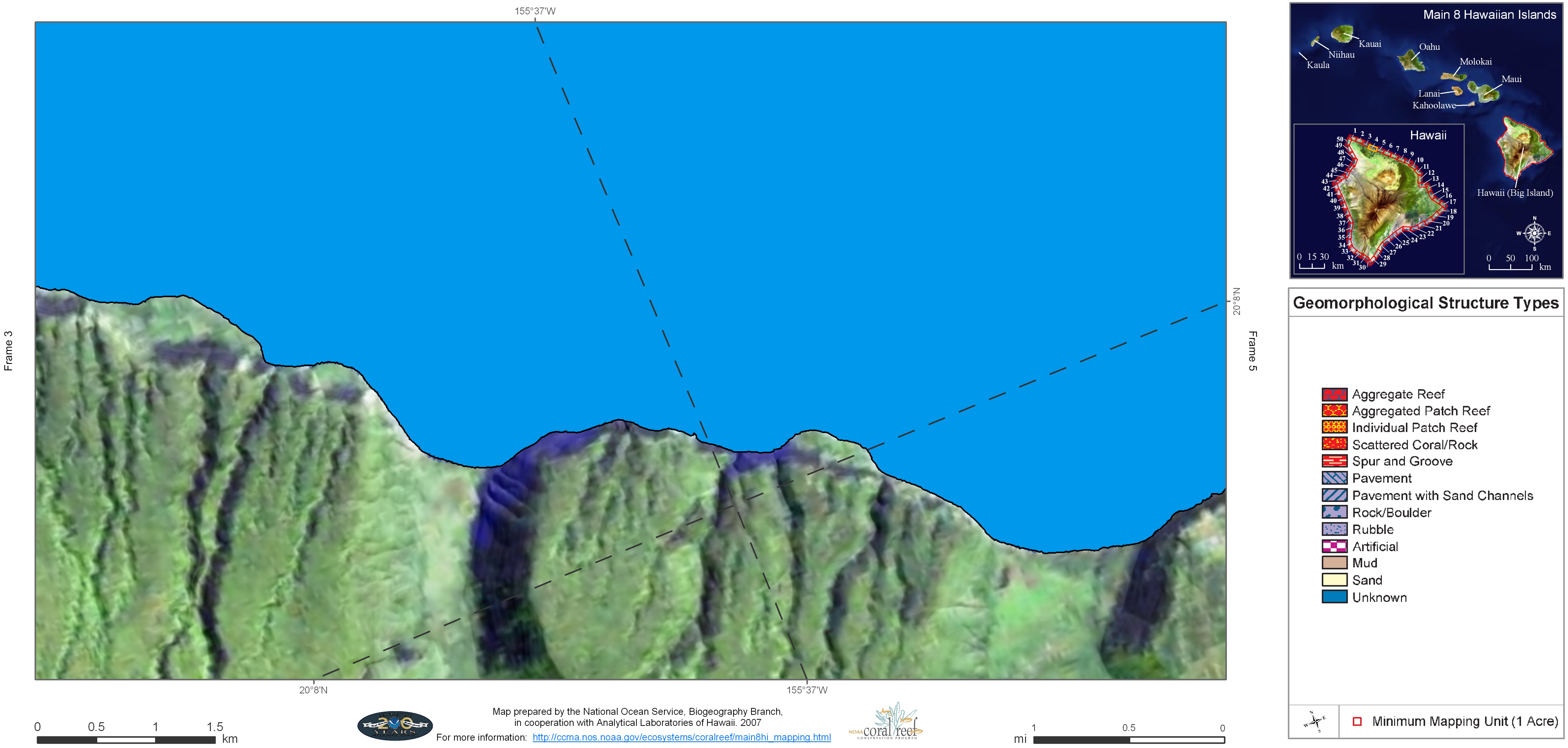
Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 4)


155°37'W
Frame 3
20°8'N
Frame 5
20°8'N
155°37'W
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Hawaii
0 15 30 km
0 50 100 km
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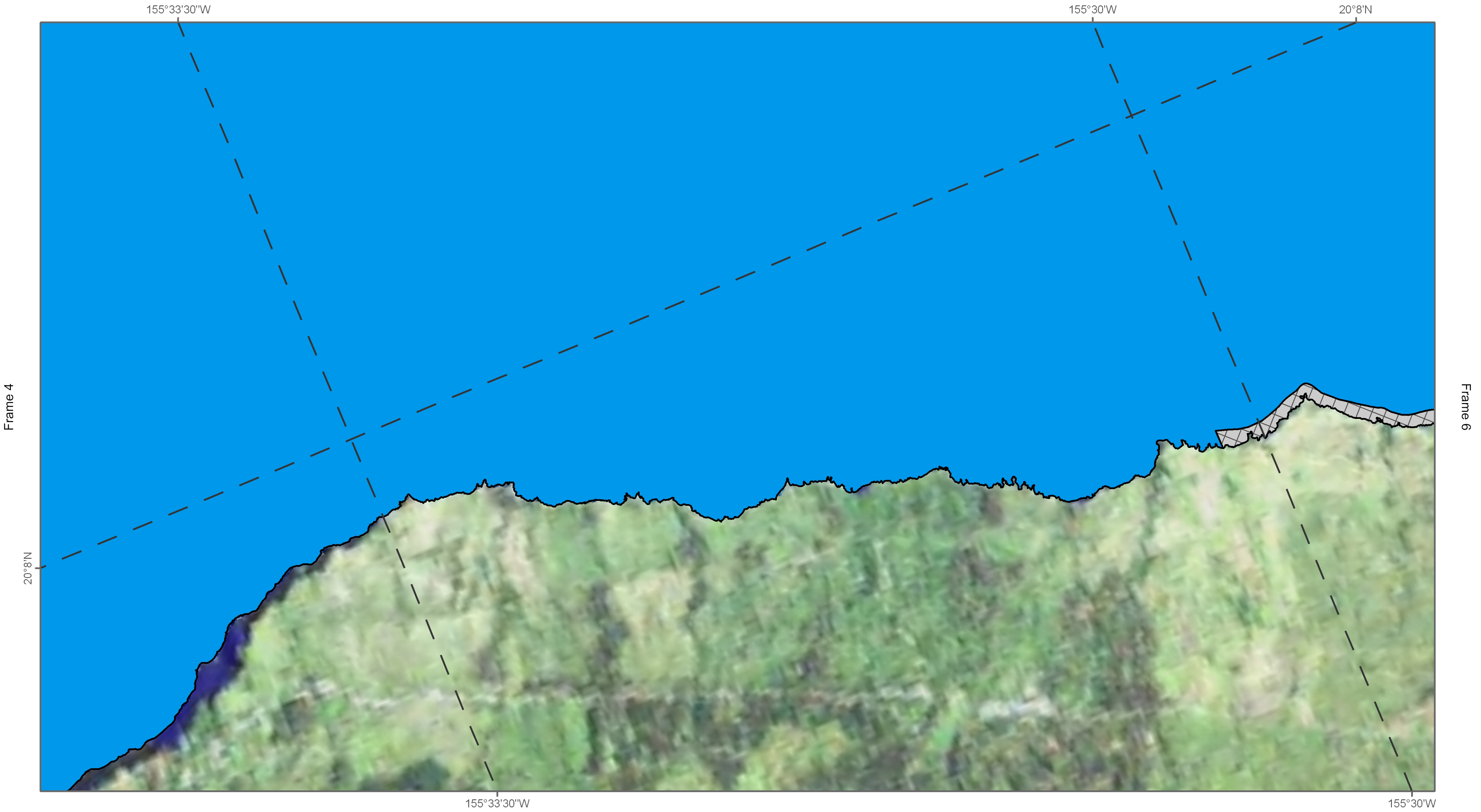
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)
0 0.5 1 1.5 km
1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 5)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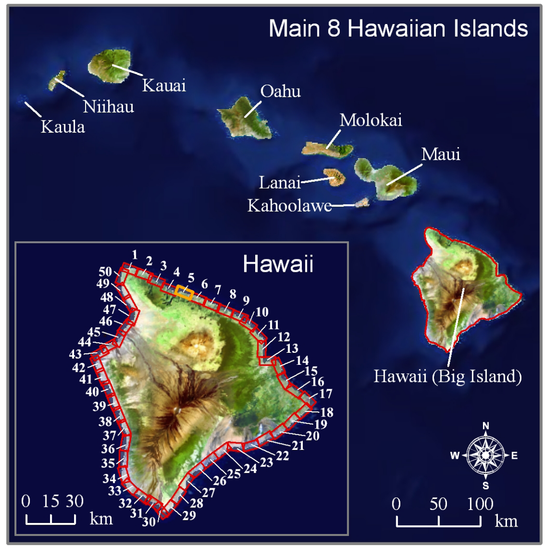
155°30'W
20°8'N
Frame 4
Frame 6
20°8'N
155°33'30"W
155°30'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km

Biological Cover Types

- ■ Coral 10%-<50%
- ▨ Coral 50%-<90%
- ■ Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- ■ Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- ■ Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- ■ Uncolonized 90%-100%
- □ Unclassified
- ■ Unknown

□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
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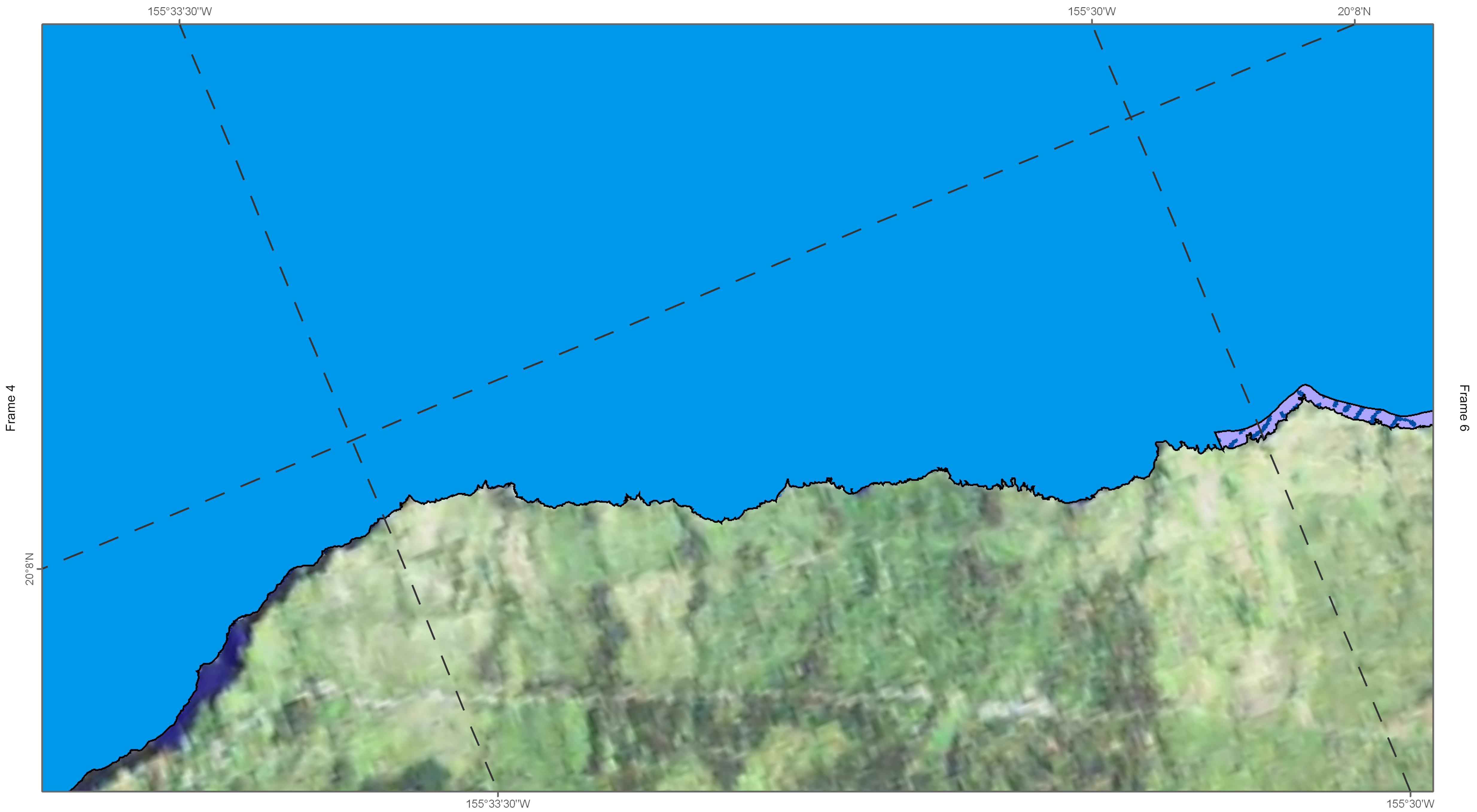
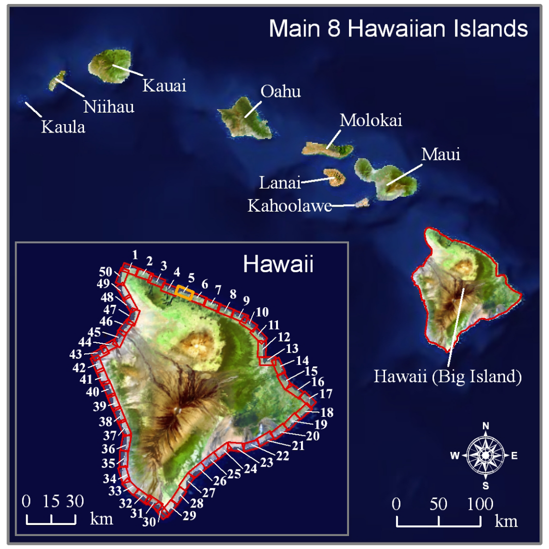
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 5)


155°33'30"W
155°30'W
20°8'N
Frame 4
20°8'N
Frame 6
155°33'30"W
155°30'W

0 0.5 1 1.5
km
1 0.5 0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
S
E
W

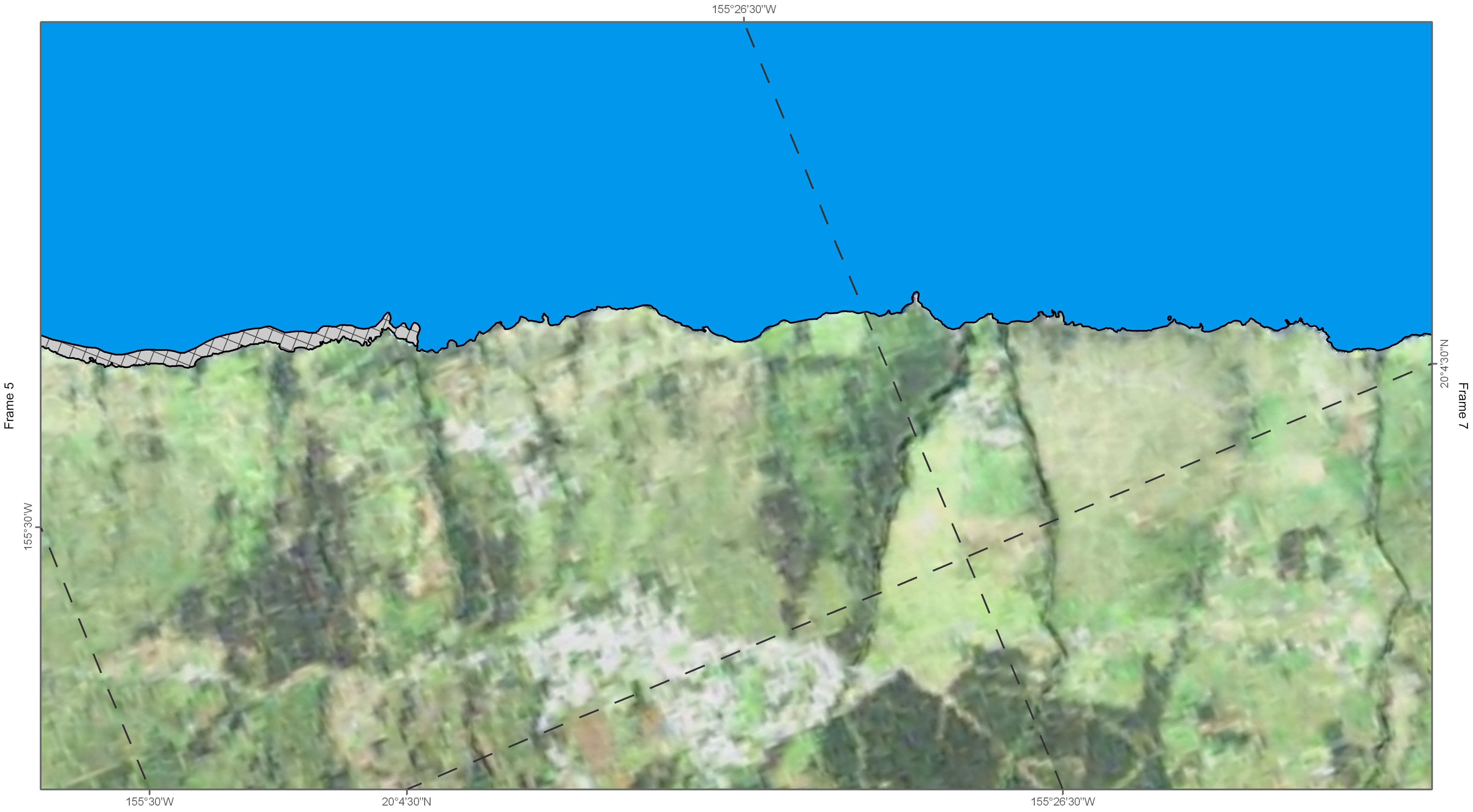
Geomorphological Structure Types

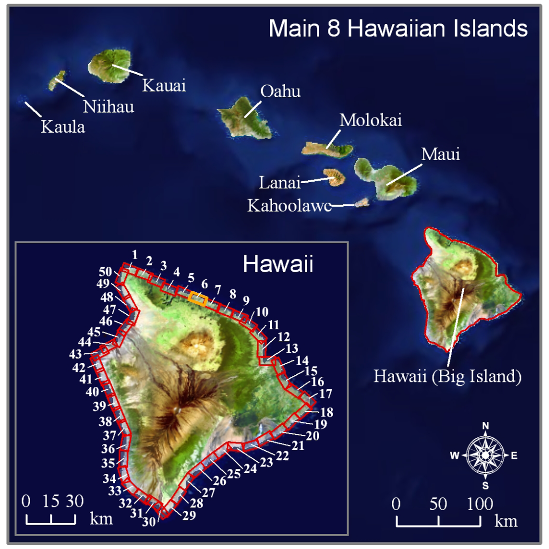
- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 6)


155°26'30"W
Frame 5
155°30'W
20°4'30"N
Frame 7
155°30'W
20°4'30"N
155°26'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

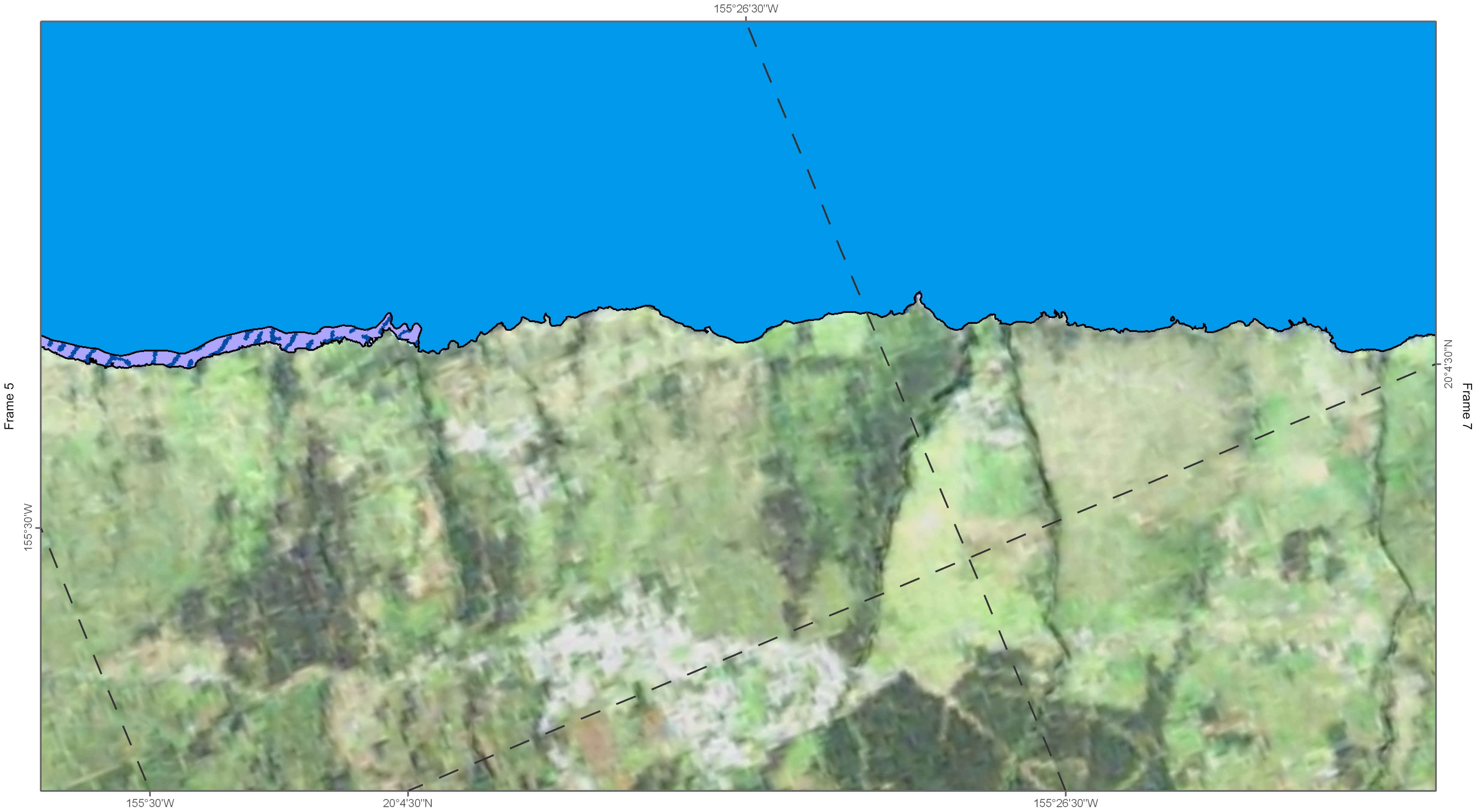
□ Minimum Mapping Unit (1 Acre)

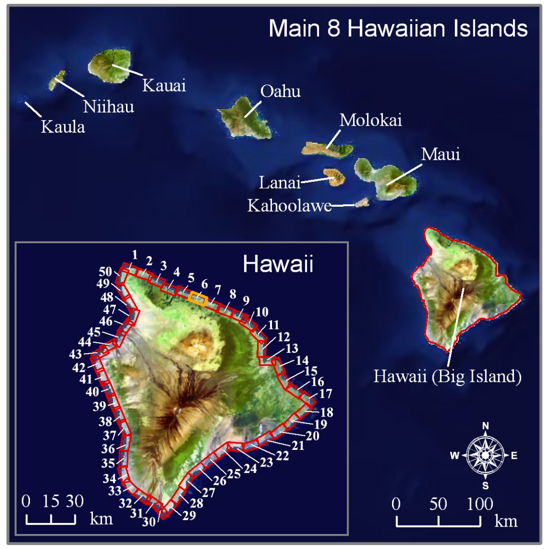
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 6)


155°26'30"W
Frame 5
155°30'W
20°4'30"N
Frame 7
155°30'W
20°4'30"N
155°26'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
Hawaii (Big Island)
N
W
E
S
0 50 100 km

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

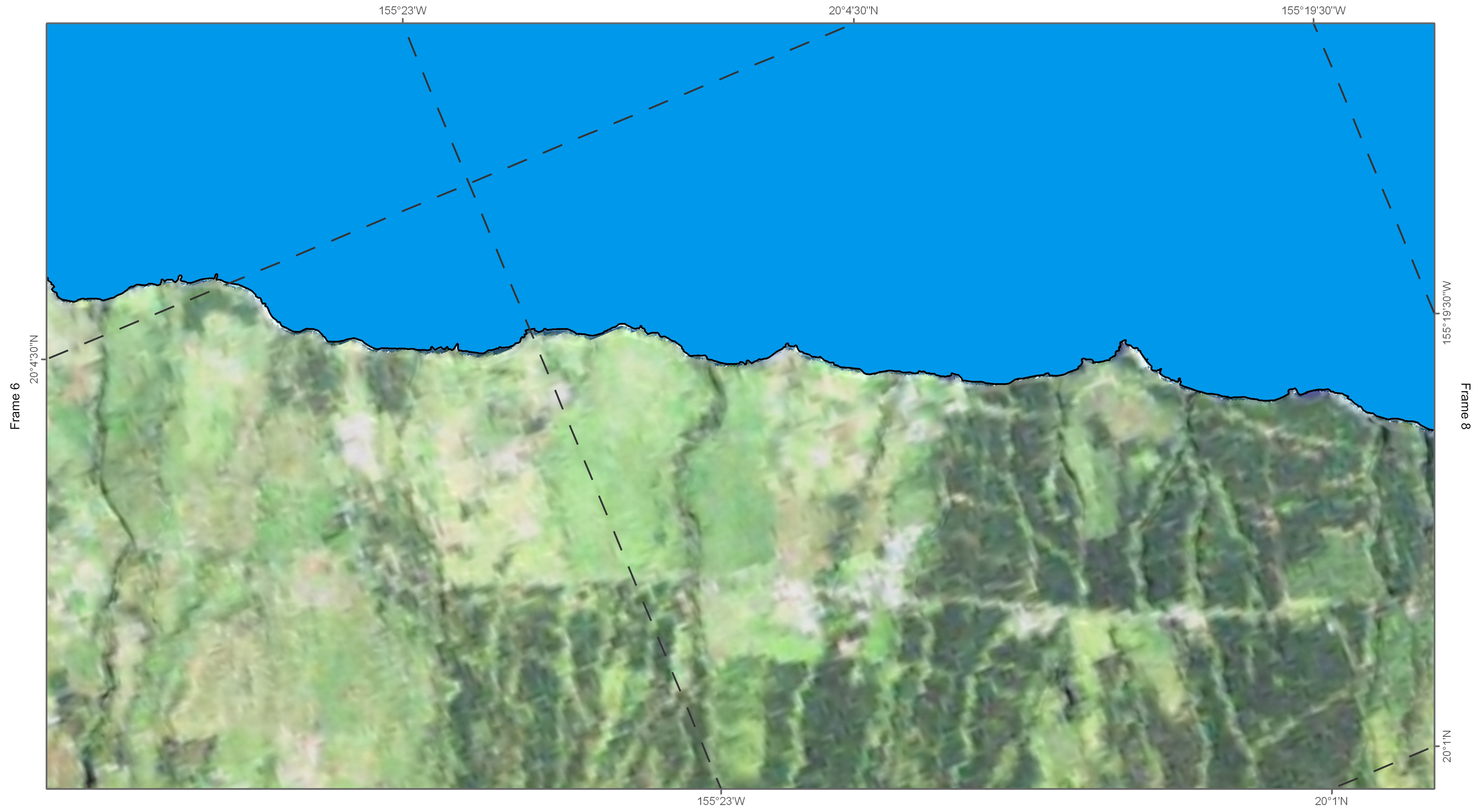
□ Minimum Mapping Unit (1 Acre)

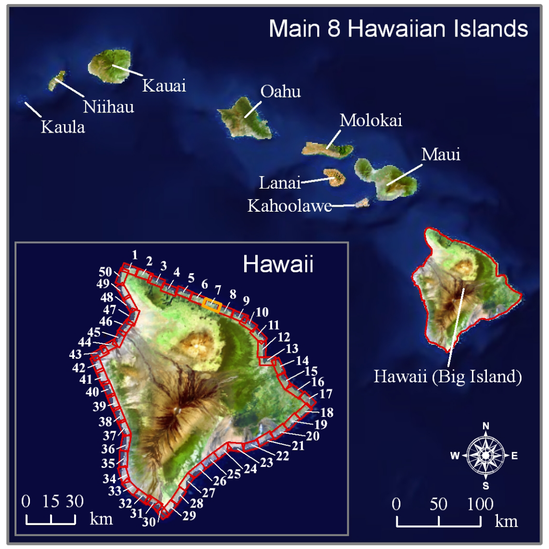
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 7)


155°23'W
20°4'30"N
155°19'30"W
20°4'30"N
Frame 6
155°19'30"W
Frame 8
20°1'N
155°23'W
20°1'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

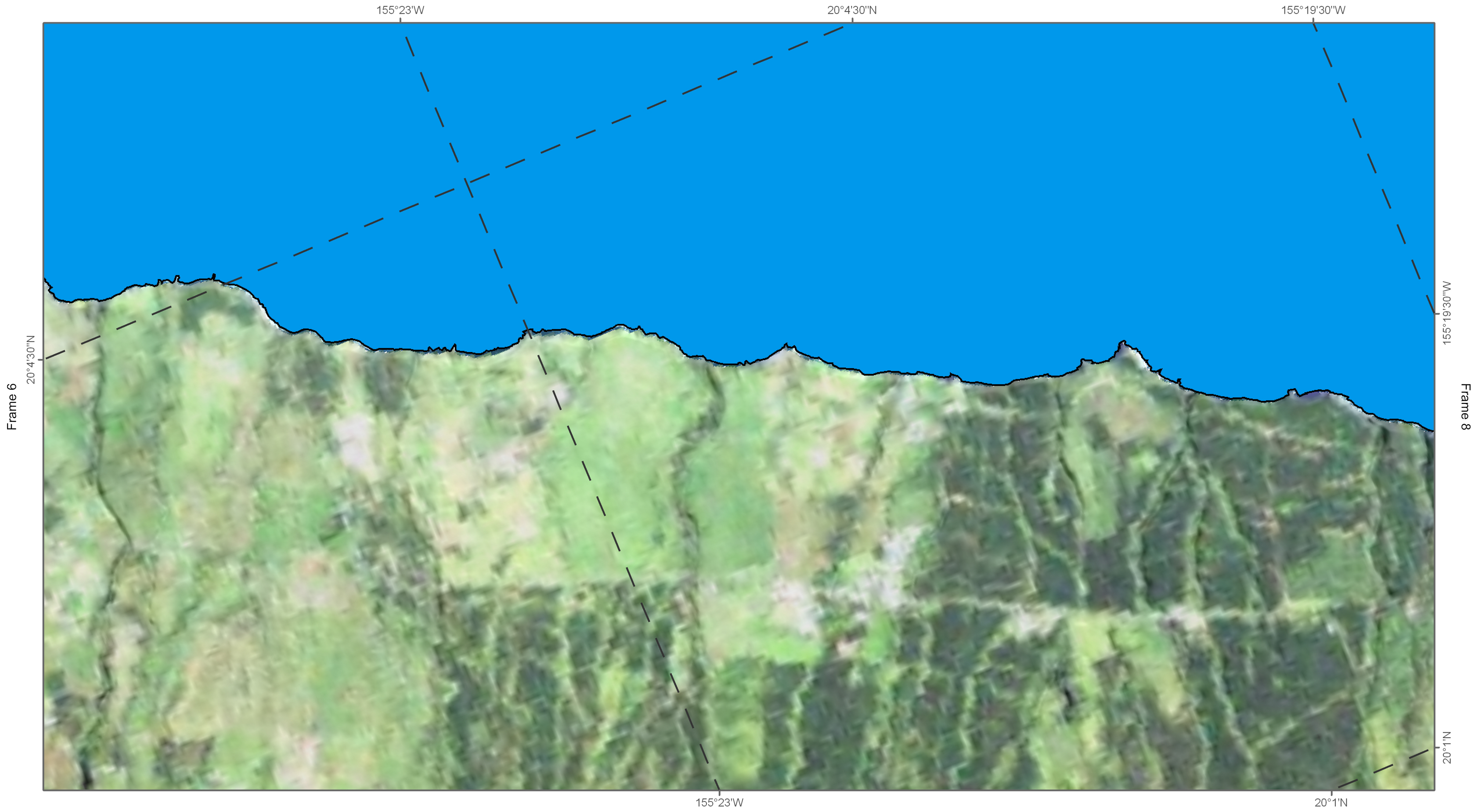
□ Minimum Mapping Unit (1 Acre)

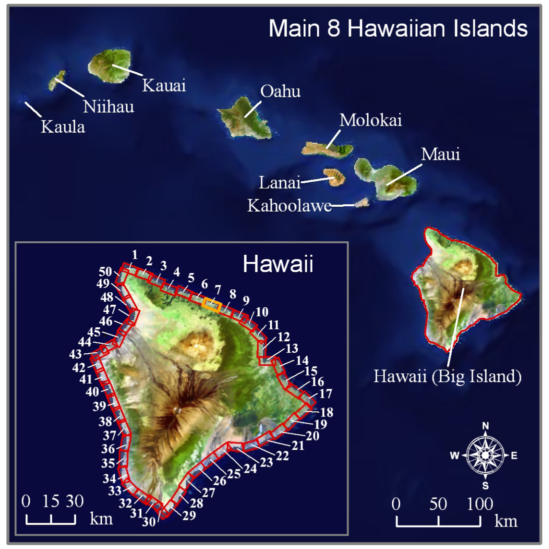
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 7)


155°23'W
20°4'30"N
155°19'30"W
Frame 6
20°4'30"N
155°19'30"W
Frame 8
20°1'N
155°23'W
20°1'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

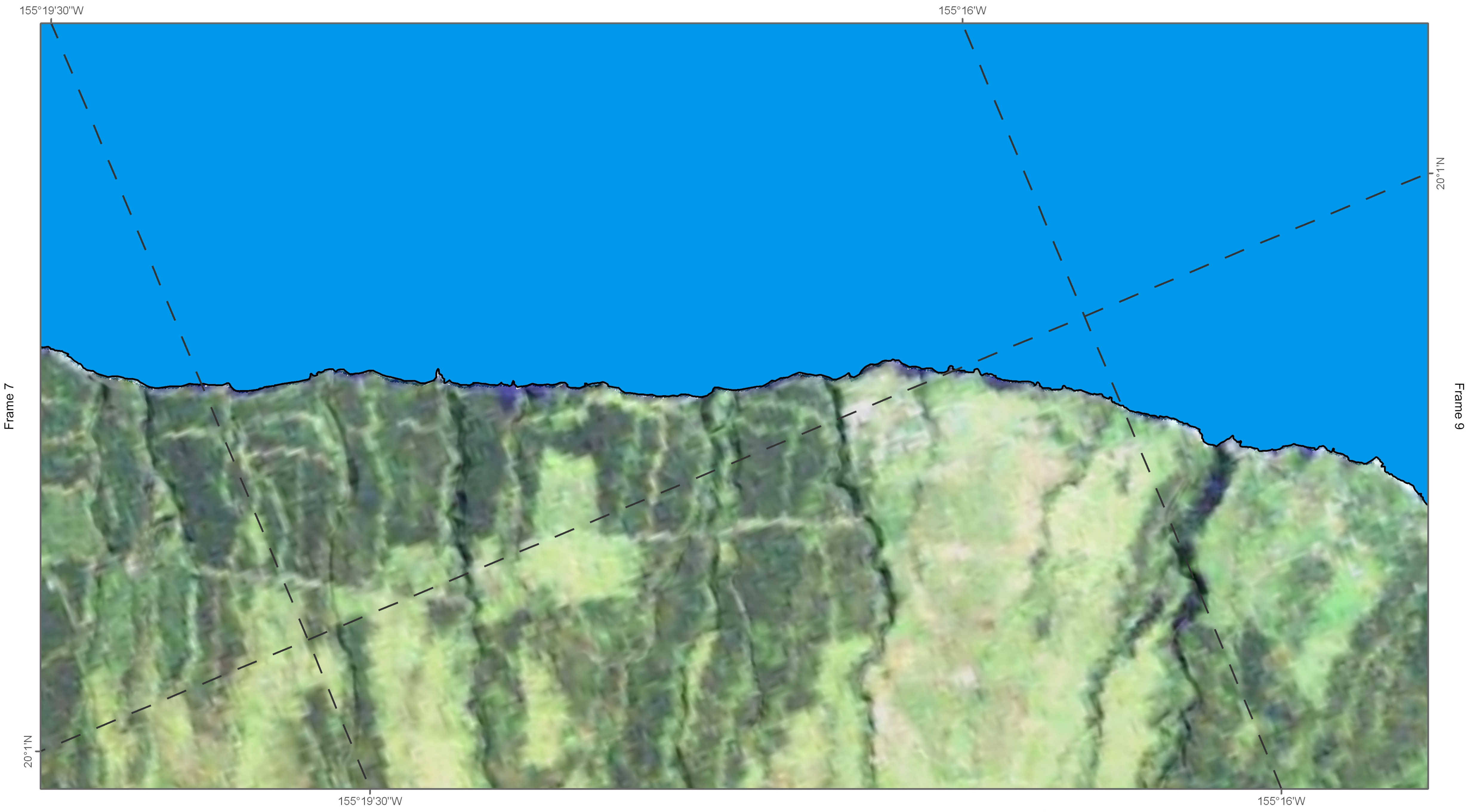
□ Minimum Mapping Unit (1 Acre)

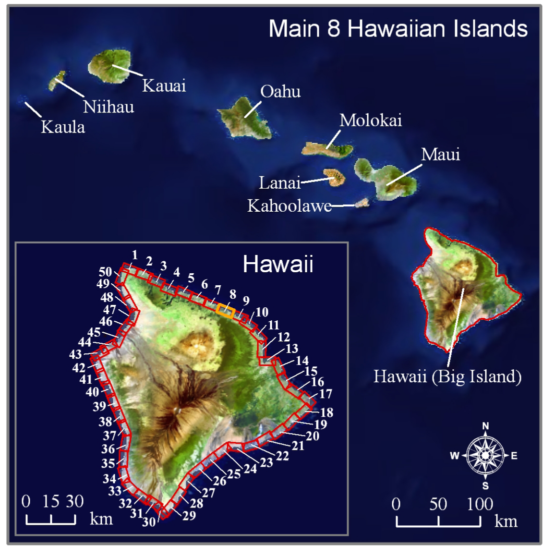
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 8)


155°19'30"W
155°16'W
20°1'N
Frame 7
Frame 9
20°1'N
155°19'30"W
155°16'W
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

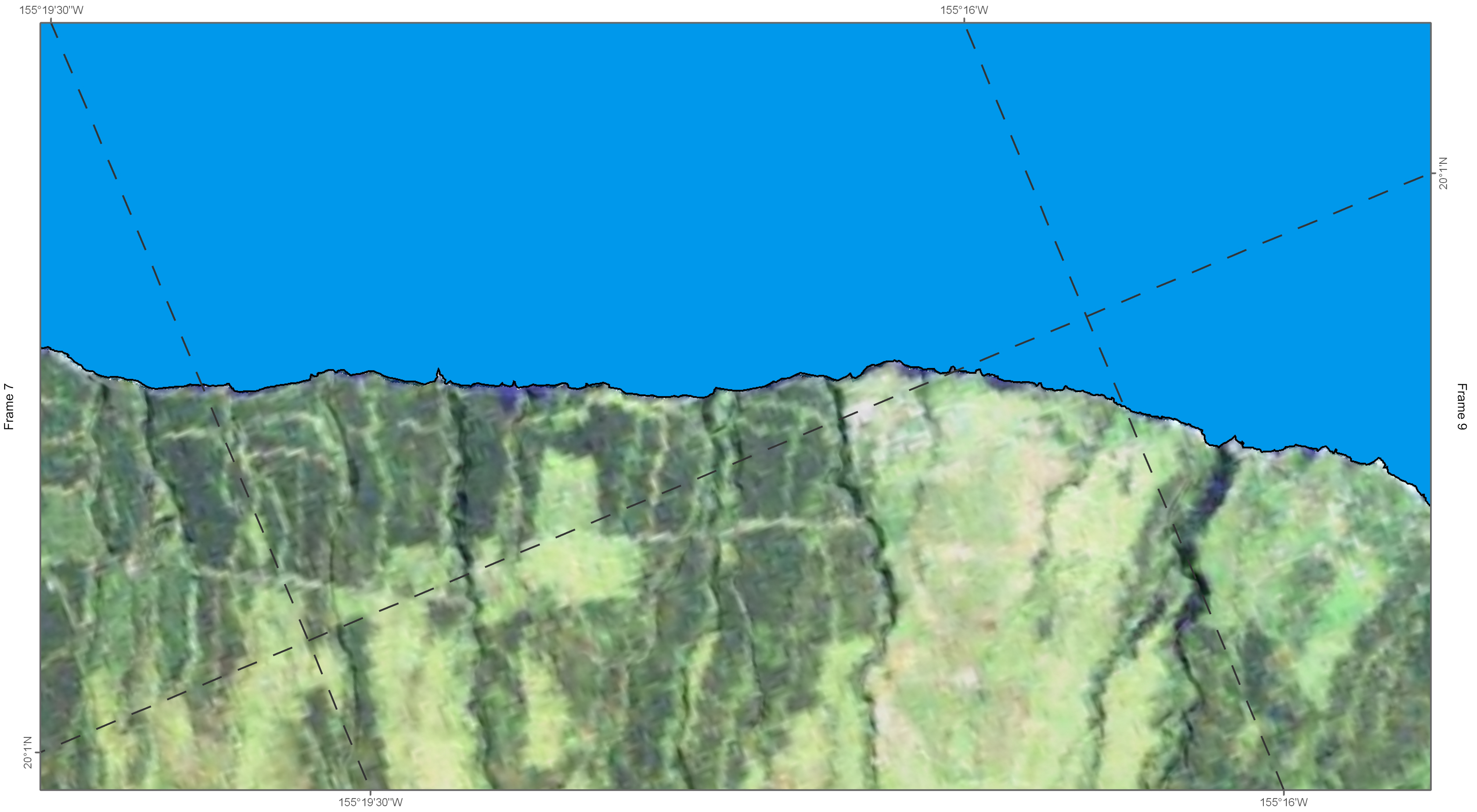
Biological Cover Types

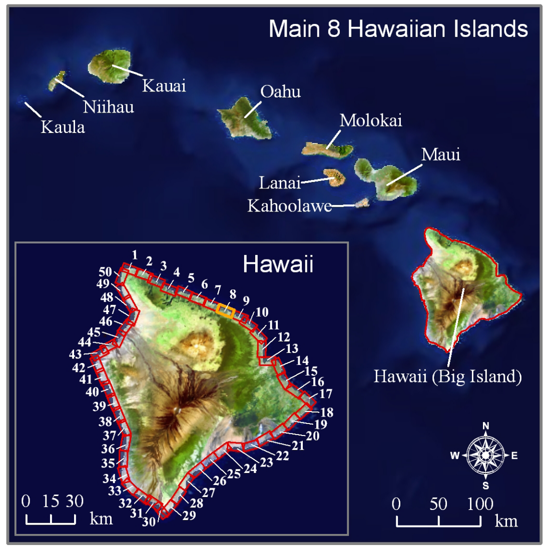
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 8)


155°19'30"W
155°16'W
20°1'N
Frame 7
Frame 9
20°1'N
155°19'30"W
155°16'W


Main 8 Hawaiian Islands
Kauai
Oahu
Niihau
Kaula
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
E
S
W

Geomorphological Structure Types

- ▦ Aggregate Reef
- ▦ Aggregated Patch Reef
- ▦ Individual Patch Reef
- ▦ Scattered Coral/Rock
- ▤ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▦ Rock/Boulder
- ▦ Rubble
- ▦ Artificial
- ■ Mud
- □ Sand
- ■ Unknown

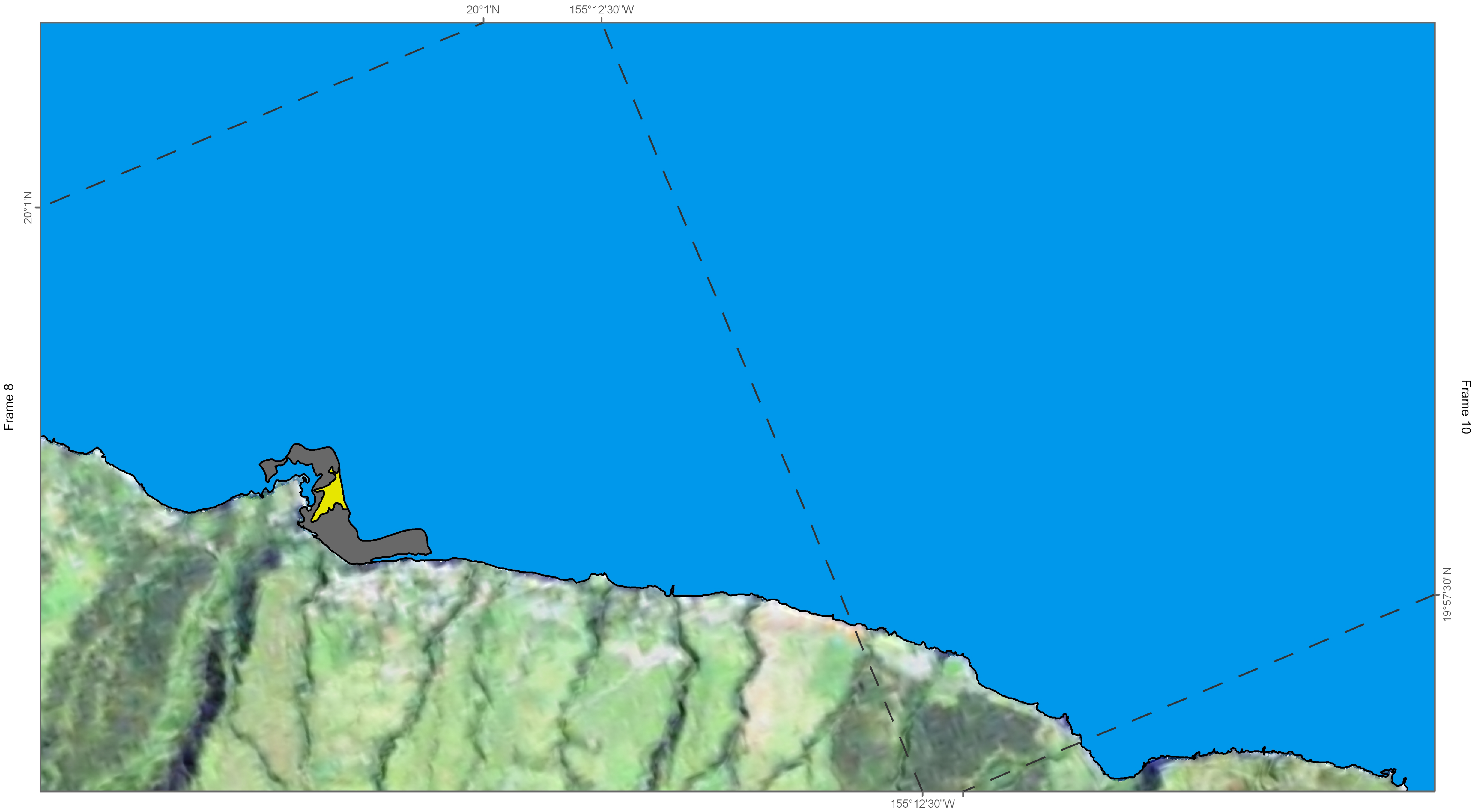
□ Minimum Mapping Unit (1 Acre)

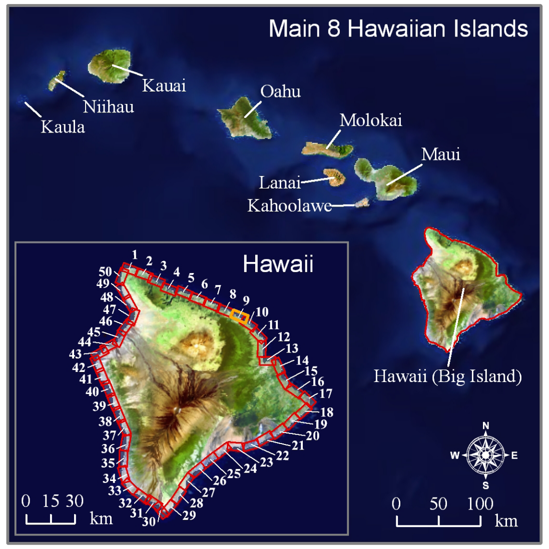
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 9)


20°1'N
155°12'30"W
20°1'N
Frame 8
Frame 10
19°57'30"N
155°12'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
E
W
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

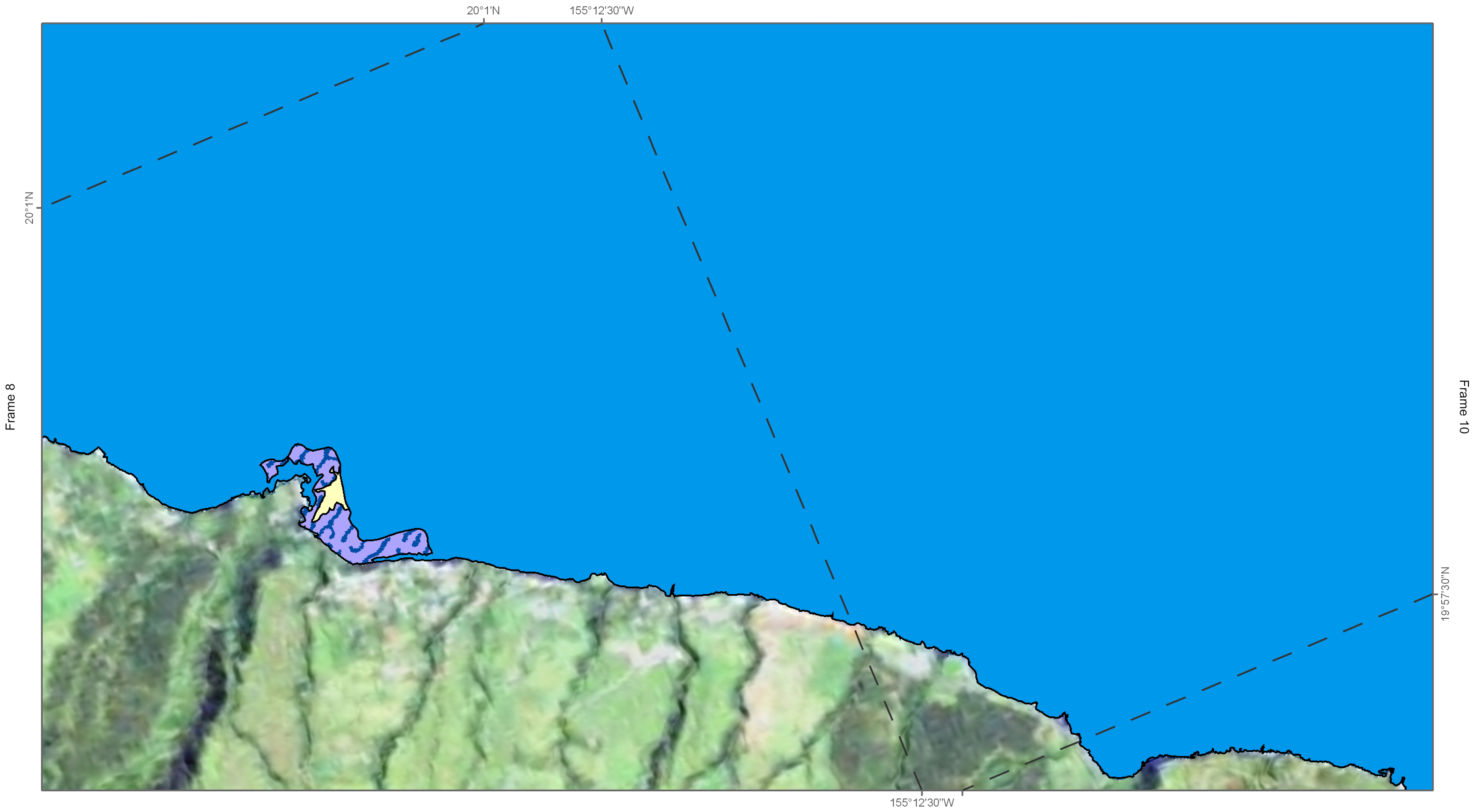
□ Minimum Mapping Unit (1 Acre)

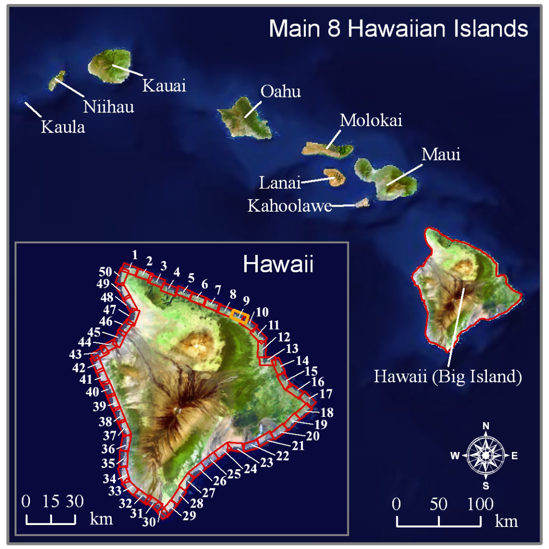
0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 9)


20°1'N
155°12'30"W
20°1'N
Frame 8
Frame 10
19°57'30"N
155°12'30"W
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

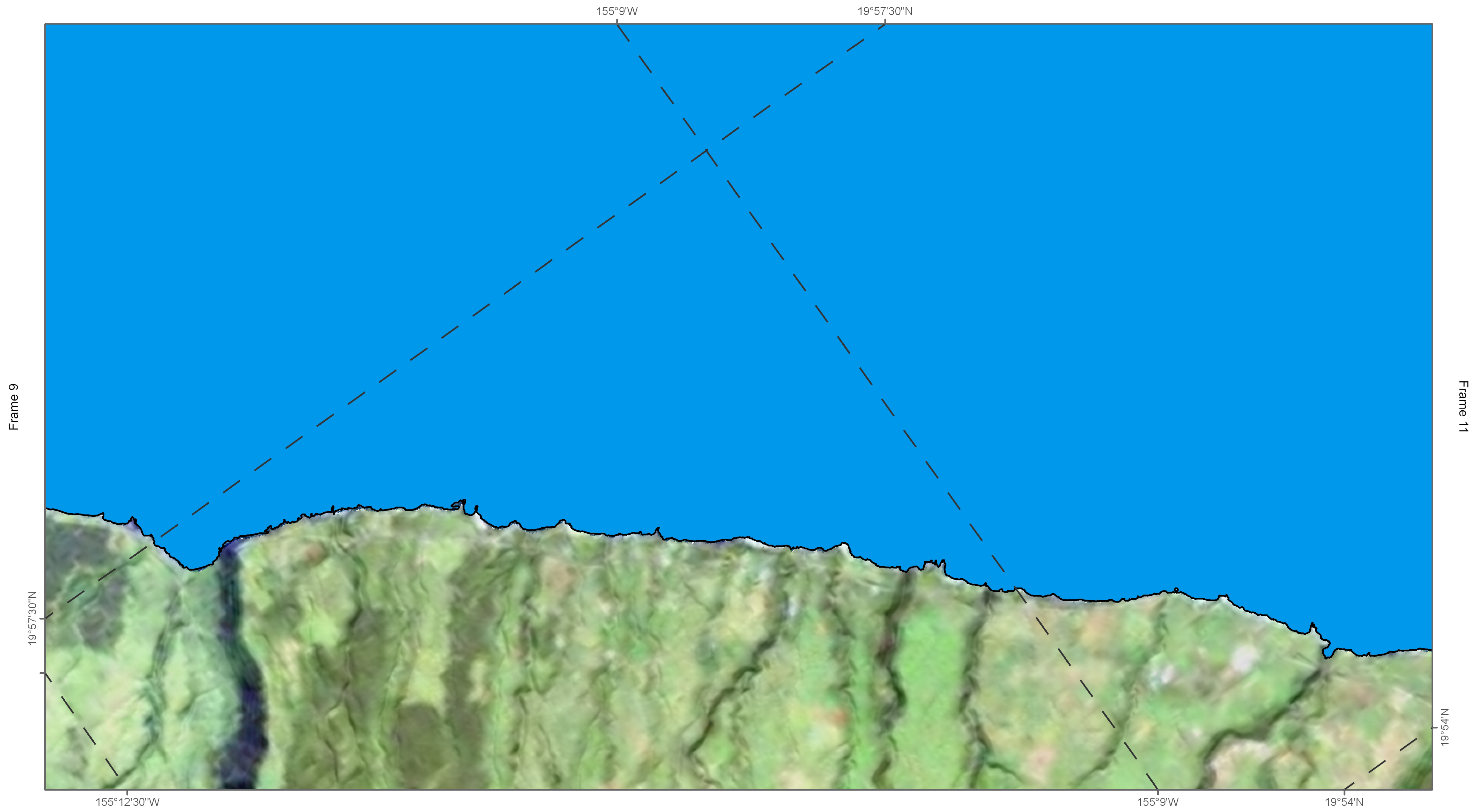
Geomorphological Structure Types

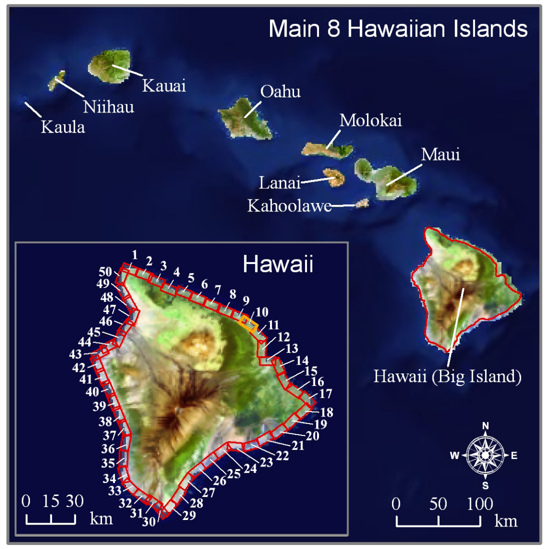
- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 10)


155°9'W
19°57'30"N
Frame 9
19°57'30"N
Frame 11
19°54'N
155°12'30"W
155°9'W
19°54'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
Hawaii (Big Island)
N
W
E
S
0 50 100 km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

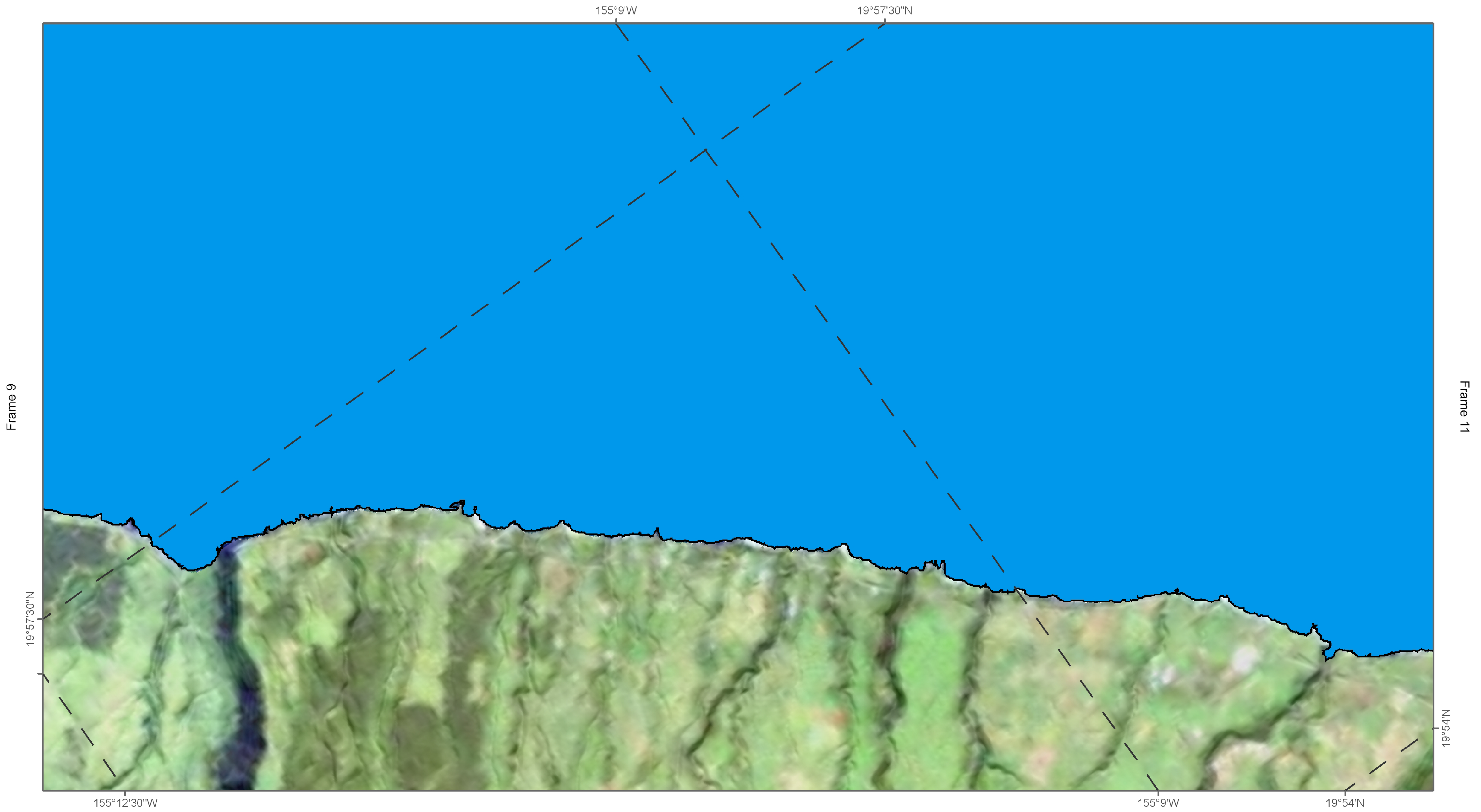
☐ Minimum Mapping Unit (1 Acre)

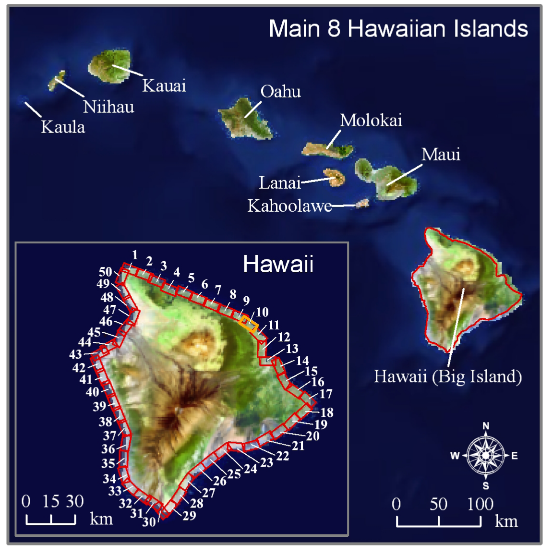
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 10)


155°9'W
19°57'30"N
Frame 9
Frame 11
19°57'30"N
19°54'N
155°12'30"W
155°9'W
19°54'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

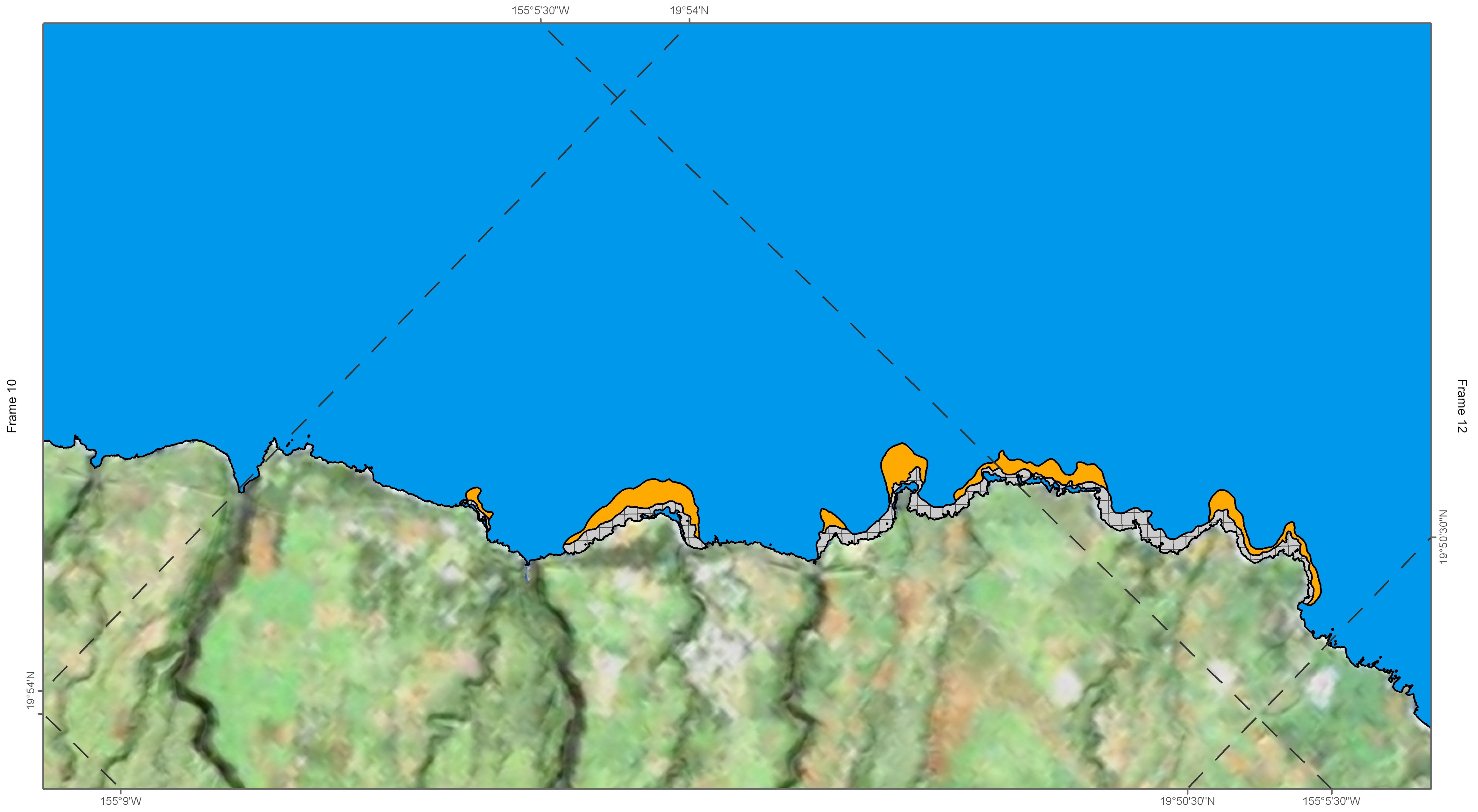
□ Minimum Mapping Unit (1 Acre)

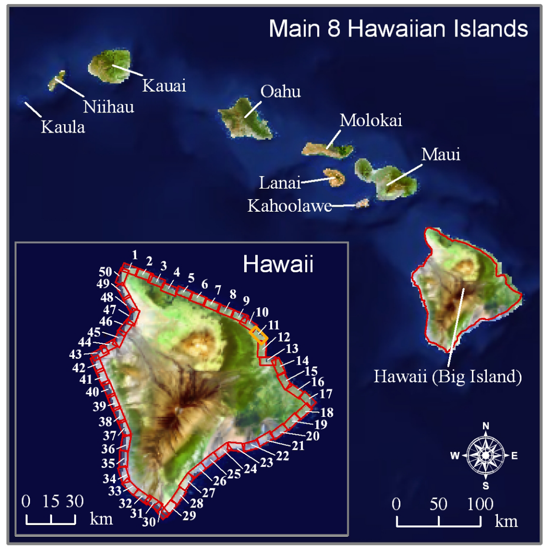
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 11)


155°5'30"W
19°54'N
Frame 10
Frame 12
19°54'N
19°50'30"N
155°9'W
19°50'30"N
155°5'30"W
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N
E
S
W

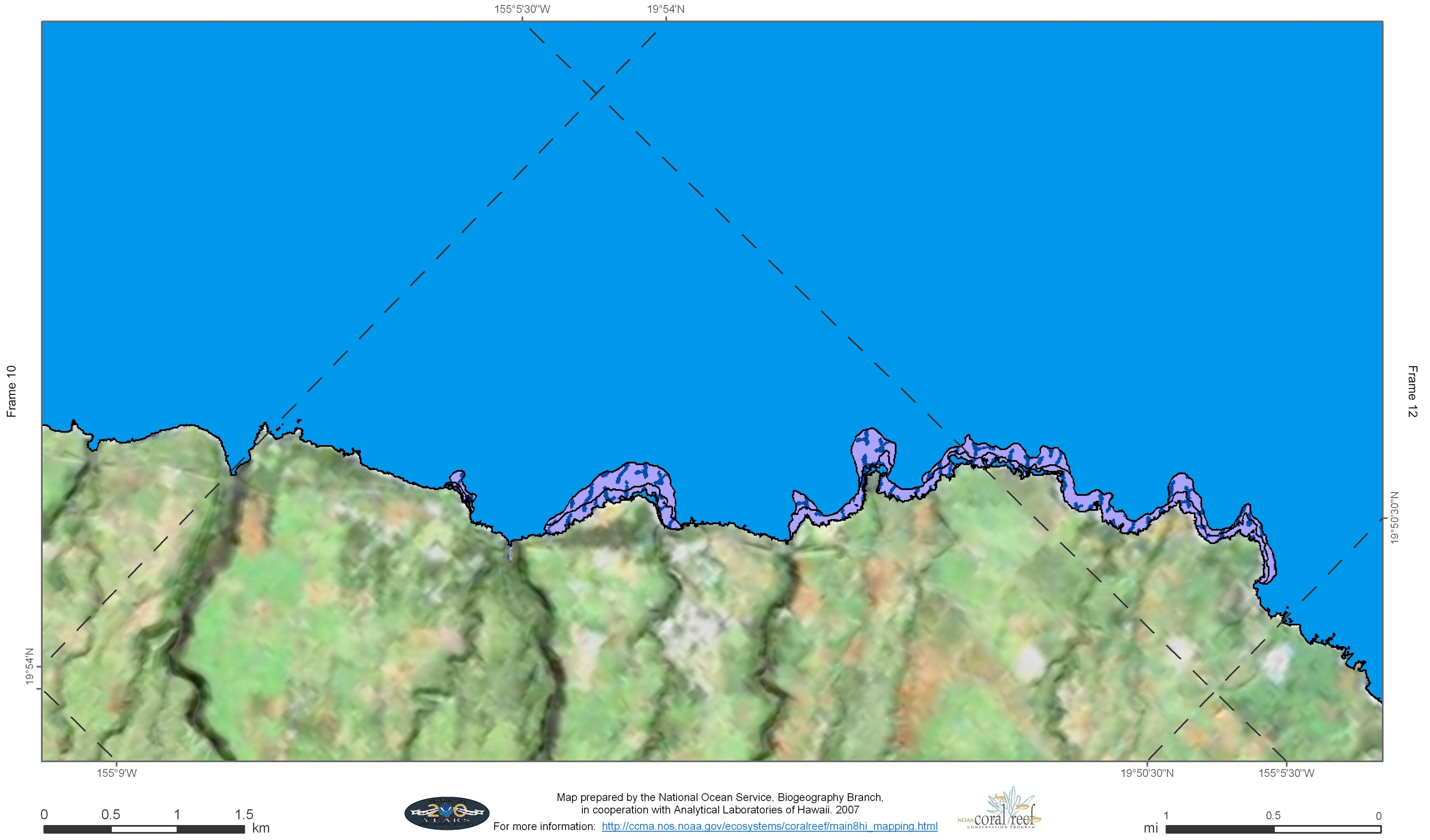
Biological Cover Types

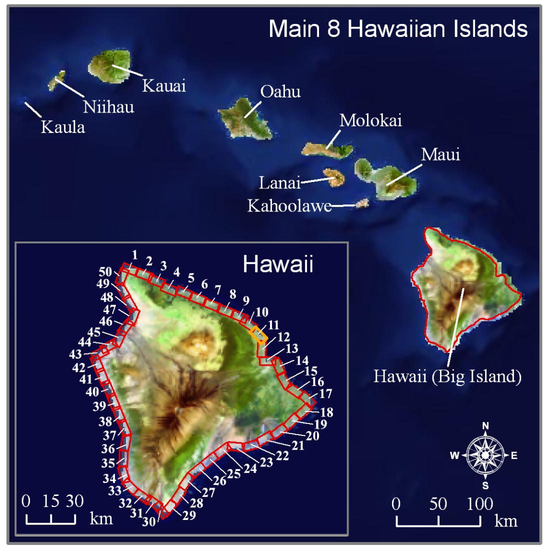
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ◻ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ◻ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ◻ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

🟥 Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 11)


155°5'30"W
19°54'N
Frame 10
Frame 12
19°54'N
19°50'30"N
155°9'W
19°50'30"N
155°5'30"W
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30
km
Hawaii (Big Island)
N
W
E
S
0 50 100
km

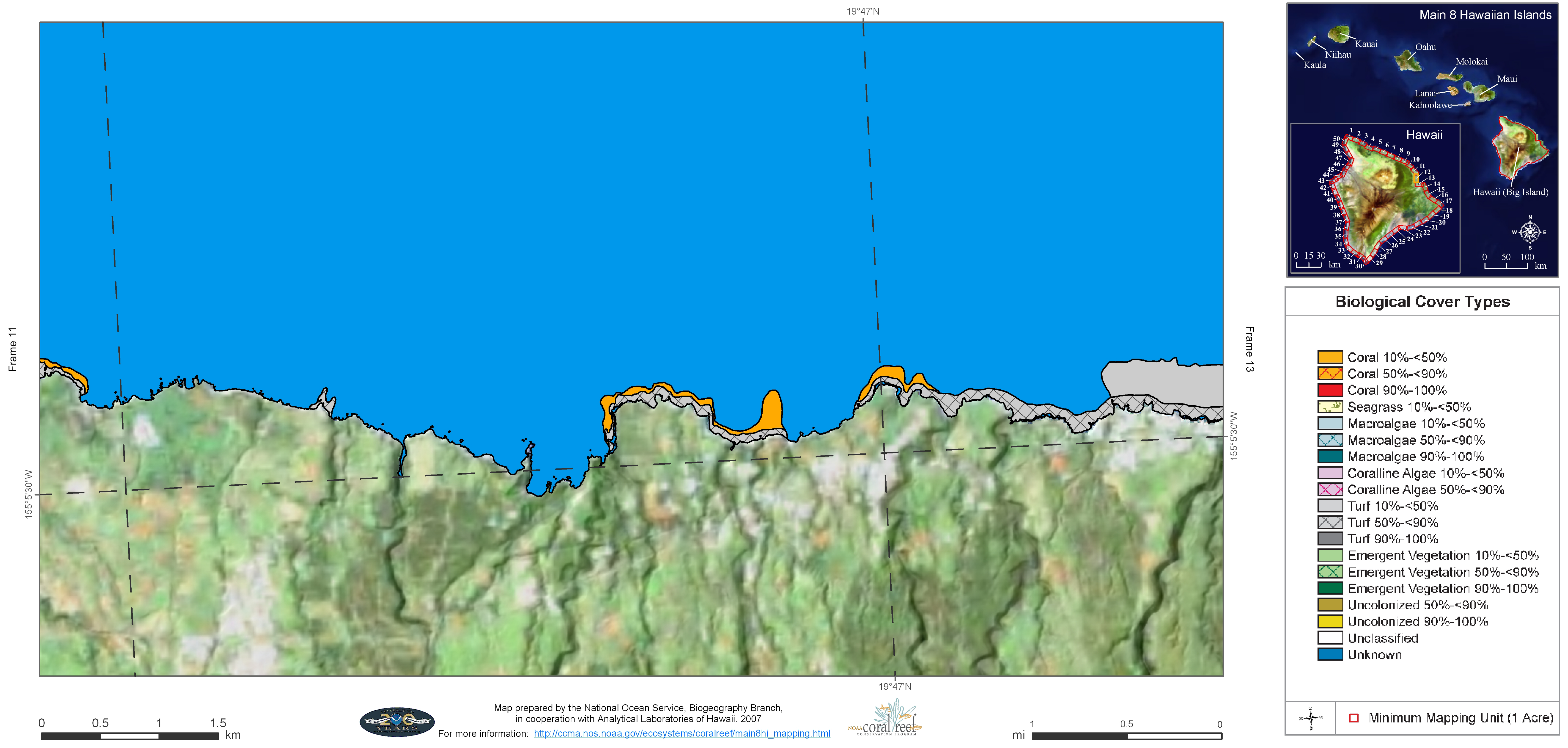
Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

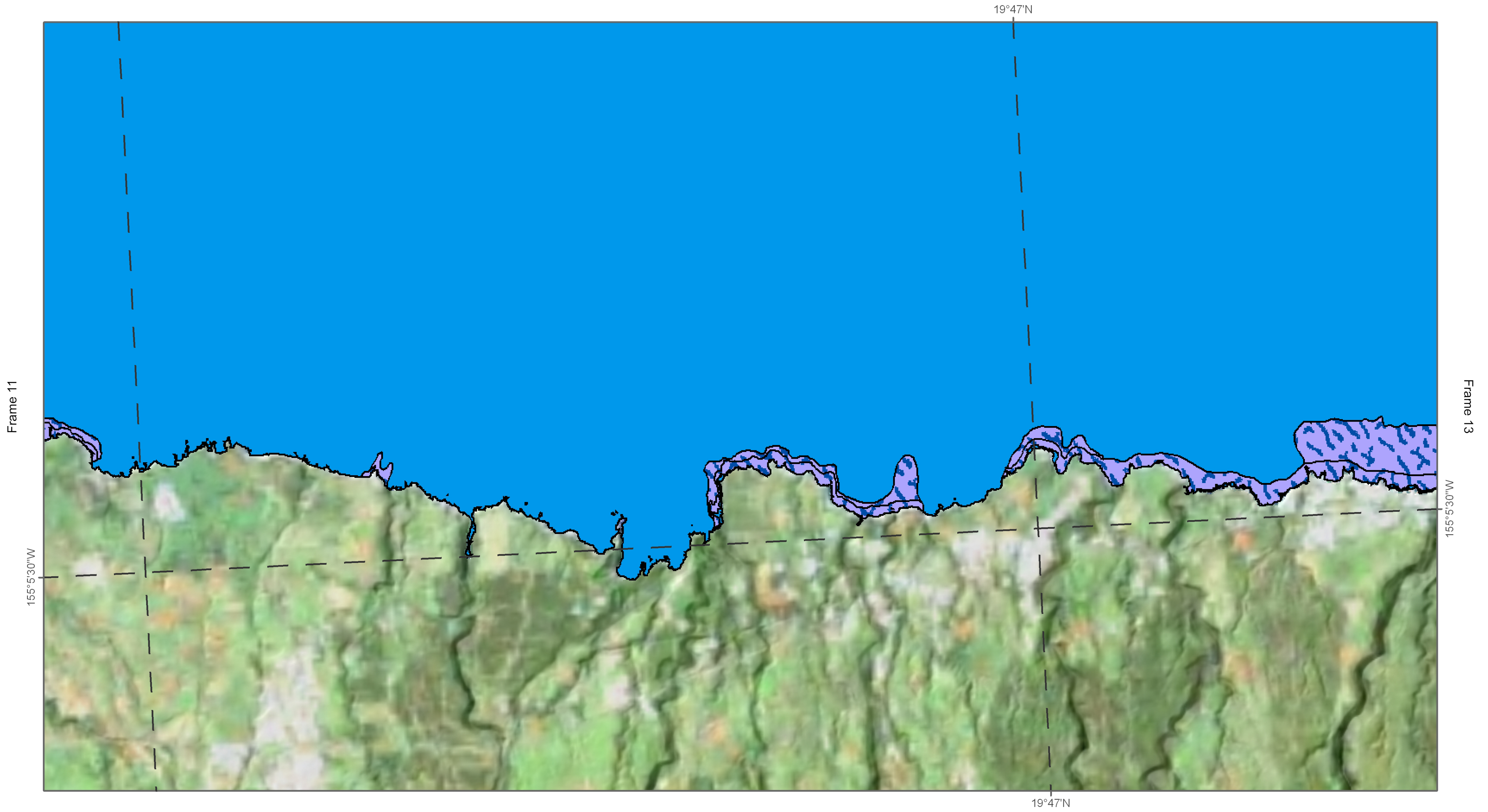
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

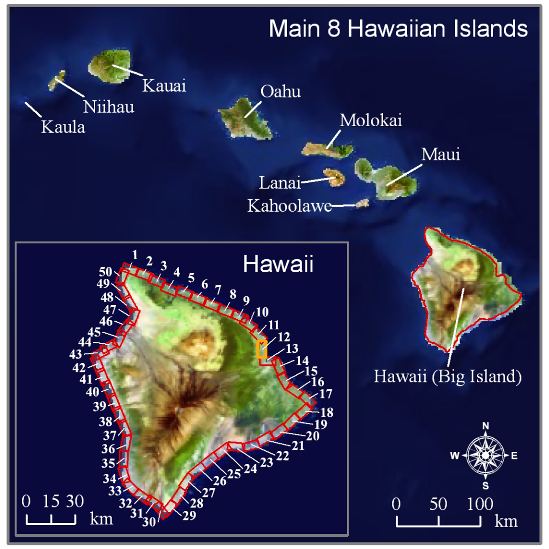
Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 12)


19°47'N
19°47'N
155°5'30"W
155°5'30"W
Frame 11
Frame 13
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Hawaii
0 15 30 km
0 50 100 km
N
W
E
S
Biological Cover Types
Coral 10%-<50%
Coral 50%-<90%
Coral 90%-100%
Seagrass 10%-<50%
Macroalgae 10%-<50%
Macroalgae 50%-<90%
Macroalgae 90%-100%
Coralline Algae 10%-<50%
Coralline Algae 50%-<90%
Turf 10%-<50%
Turf 50%-<90%
Turf 90%-100%
Emergent Vegetation 10%-<50%
Emergent Vegetation 50%-<90%
Emergent Vegetation 90%-100%
Uncolonized 50%-<90%
Uncolonized 90%-100%
Unclassified
Unknown
Minimum Mapping Unit (1 Acre)
0 0.5 1 1.5 km
1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 12)


19°47'N
Frame 11
155°5'30"W
Frame 13
155°5'30"W
19°47'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30
km
Hawaii (Big Island)
N
W
E
S
0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

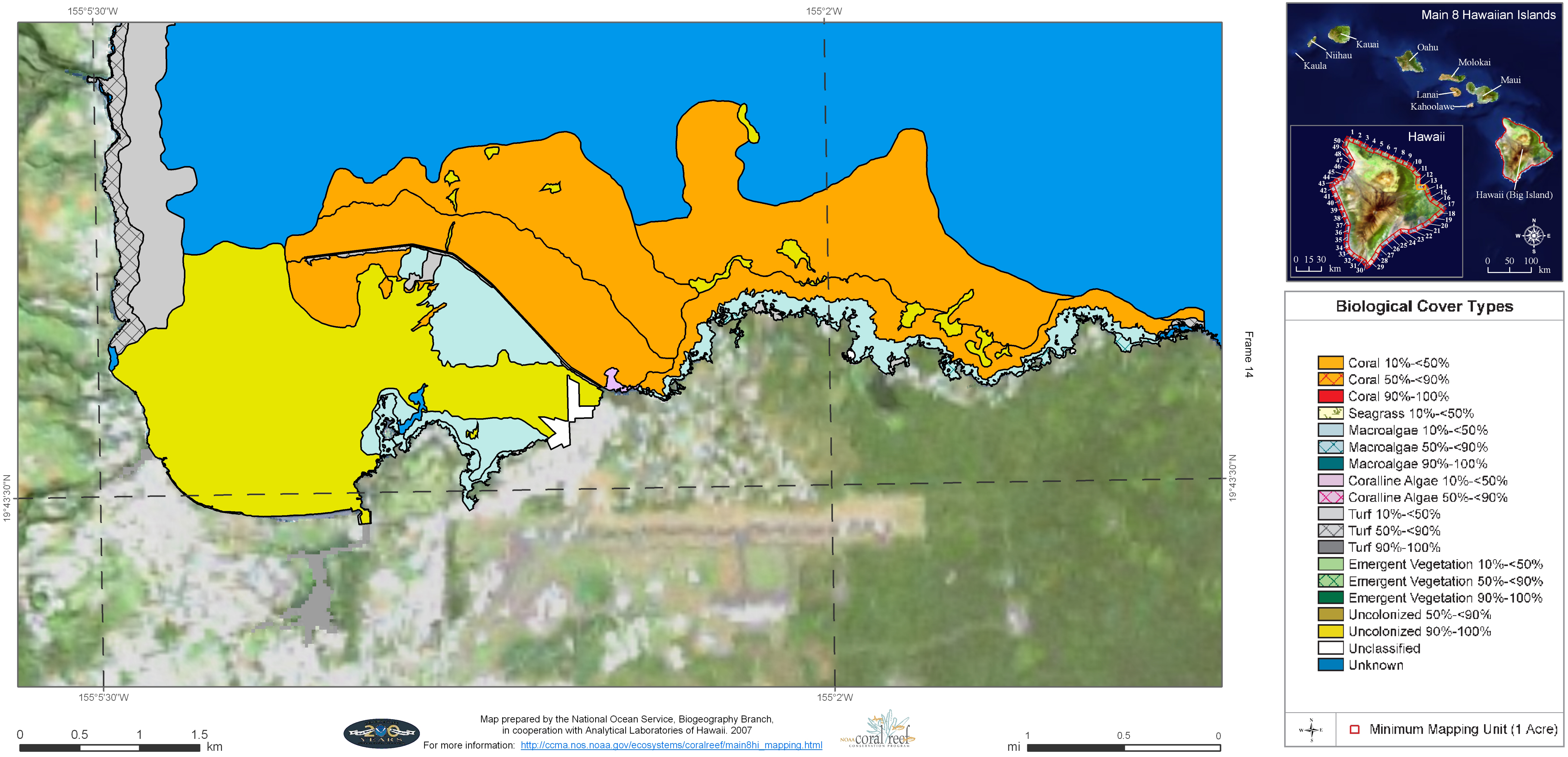
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

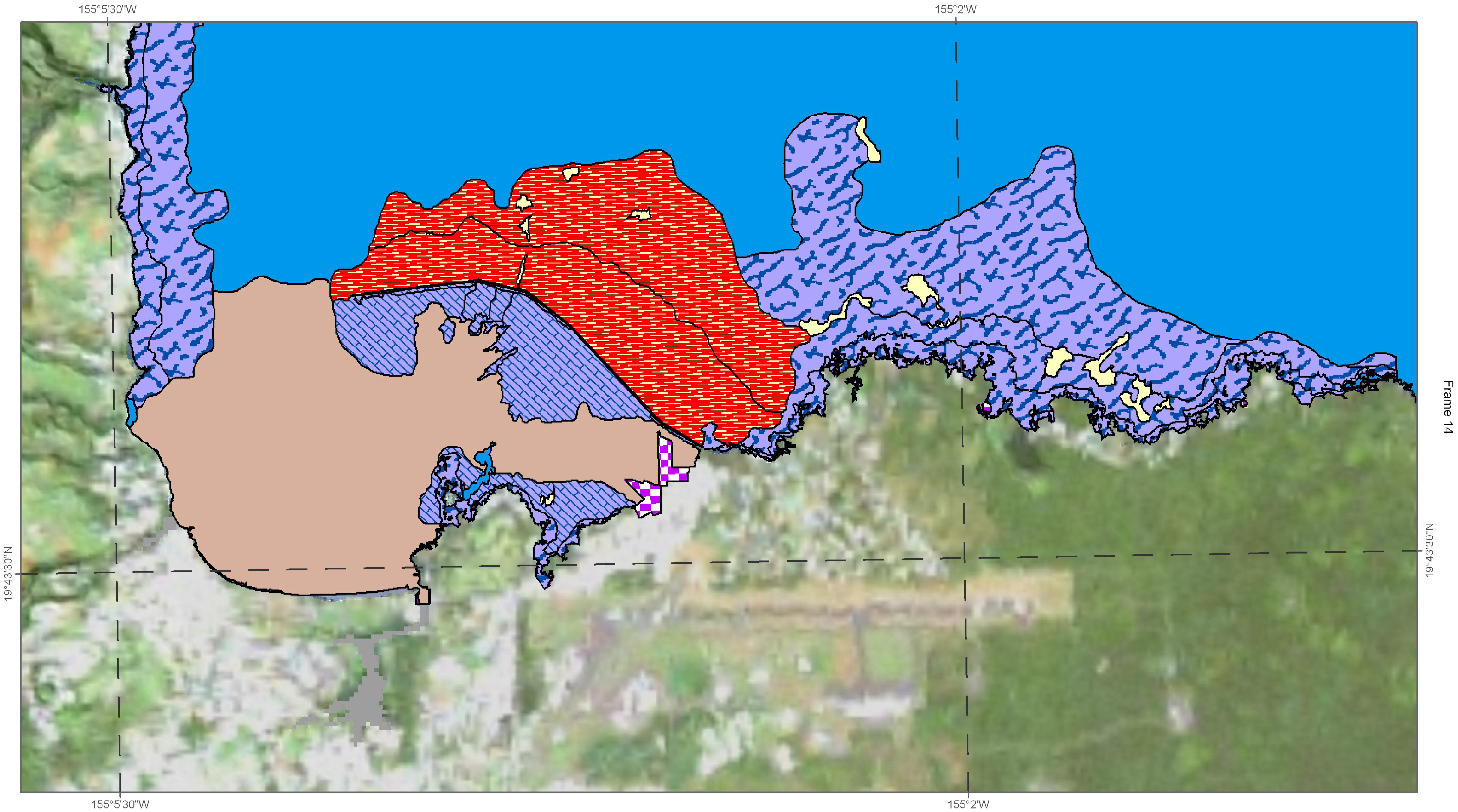
1 0.5 0
mi

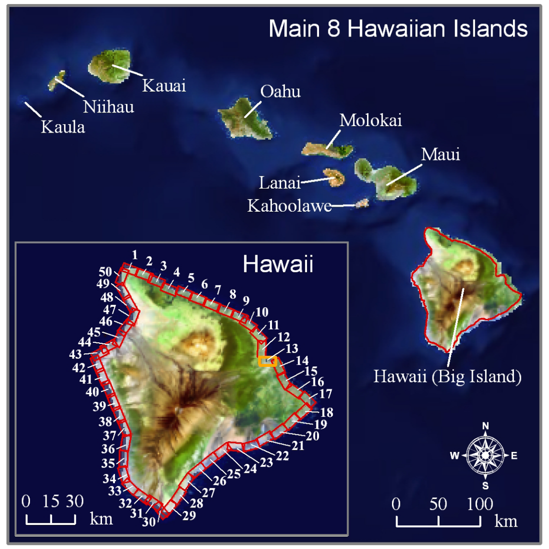
Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 13)


155°5'30"W
155°2'W
19°43'30"N
19°43'30"N
Frame 14
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Hawaii
0 15 30 km
0 50 100 km
Biological Cover Types
Coral 10%-<50%
Coral 50%-<90%
Coral 90%-100%
Seagrass 10%-<50%
Macroalgae 10%-<50%
Macroalgae 50%-<90%
Macroalgae 90%-100%
Coralline Algae 10%-<50%
Coralline Algae 50%-<90%
Turf 10%-<50%
Turf 50%-<90%
Turf 90%-100%
Emergent Vegetation 10%-<50%
Emergent Vegetation 50%-<90%
Emergent Vegetation 90%-100%
Uncolonized 50%-<90%
Uncolonized 90%-100%
Unclassified
Unknown
Minimum Mapping Unit (1 Acre)
0 0.5 1 1.5 km
1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 13)


155°5'30"W
155°2'W
19°43'30"N
19°43'30"N
Frame 14
155°5'30"W
155°2'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- 🟦 Unknown

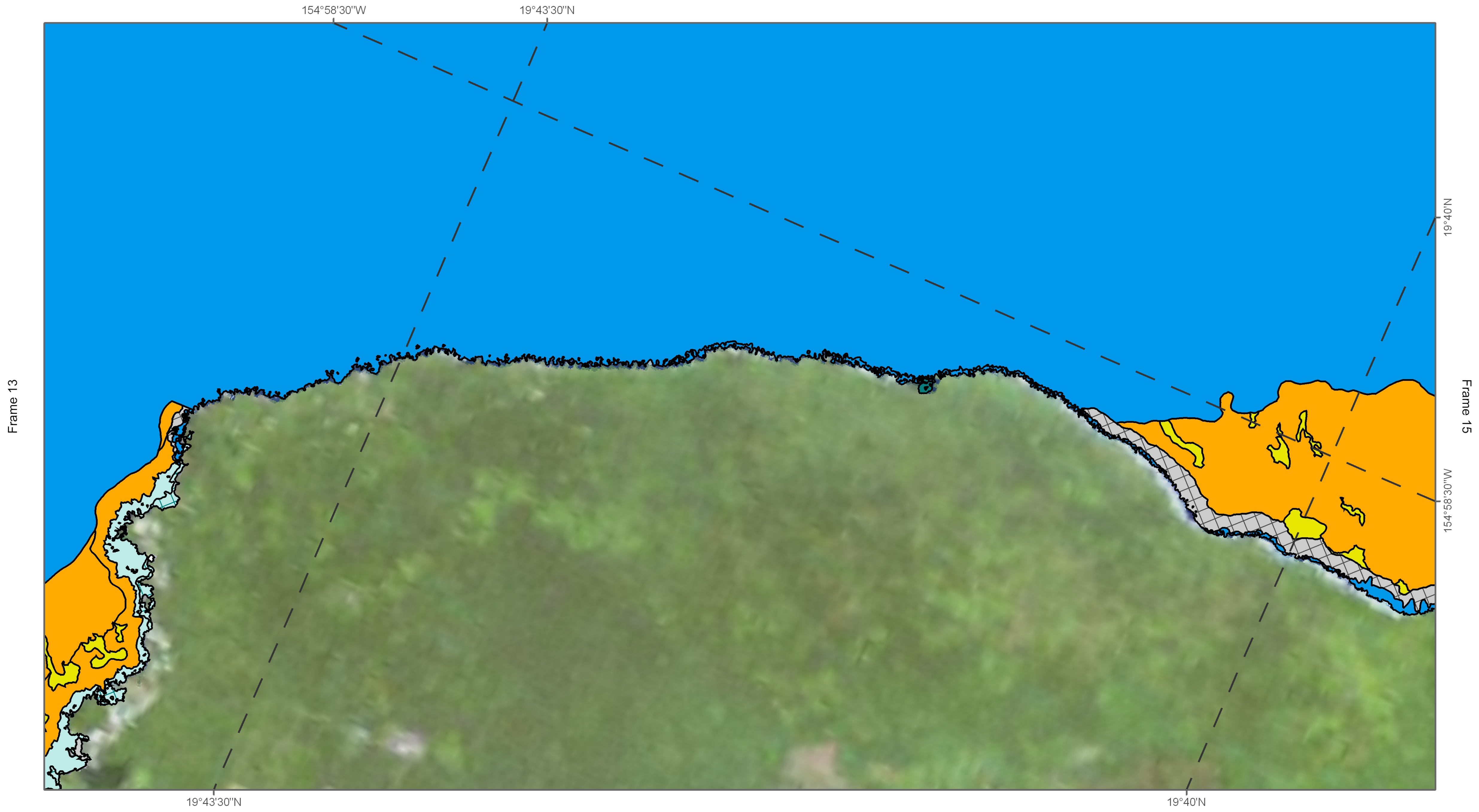
□ Minimum Mapping Unit (1 Acre)

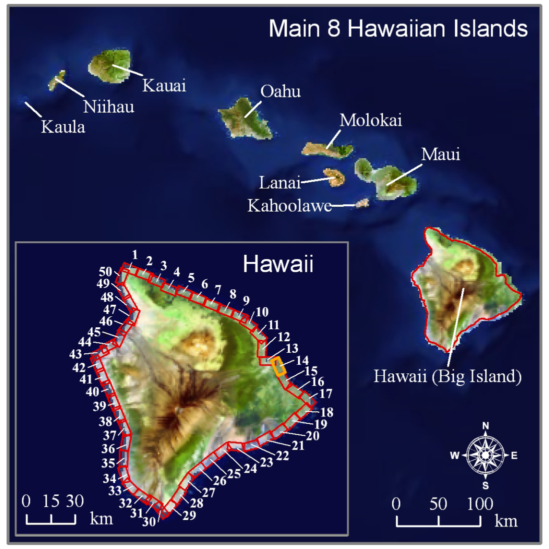
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 14)


154°58'30"W
19°43'30"N
19°40'N
154°58'30"W
Frame 13
Frame 15
19°43'30"N
19°40'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

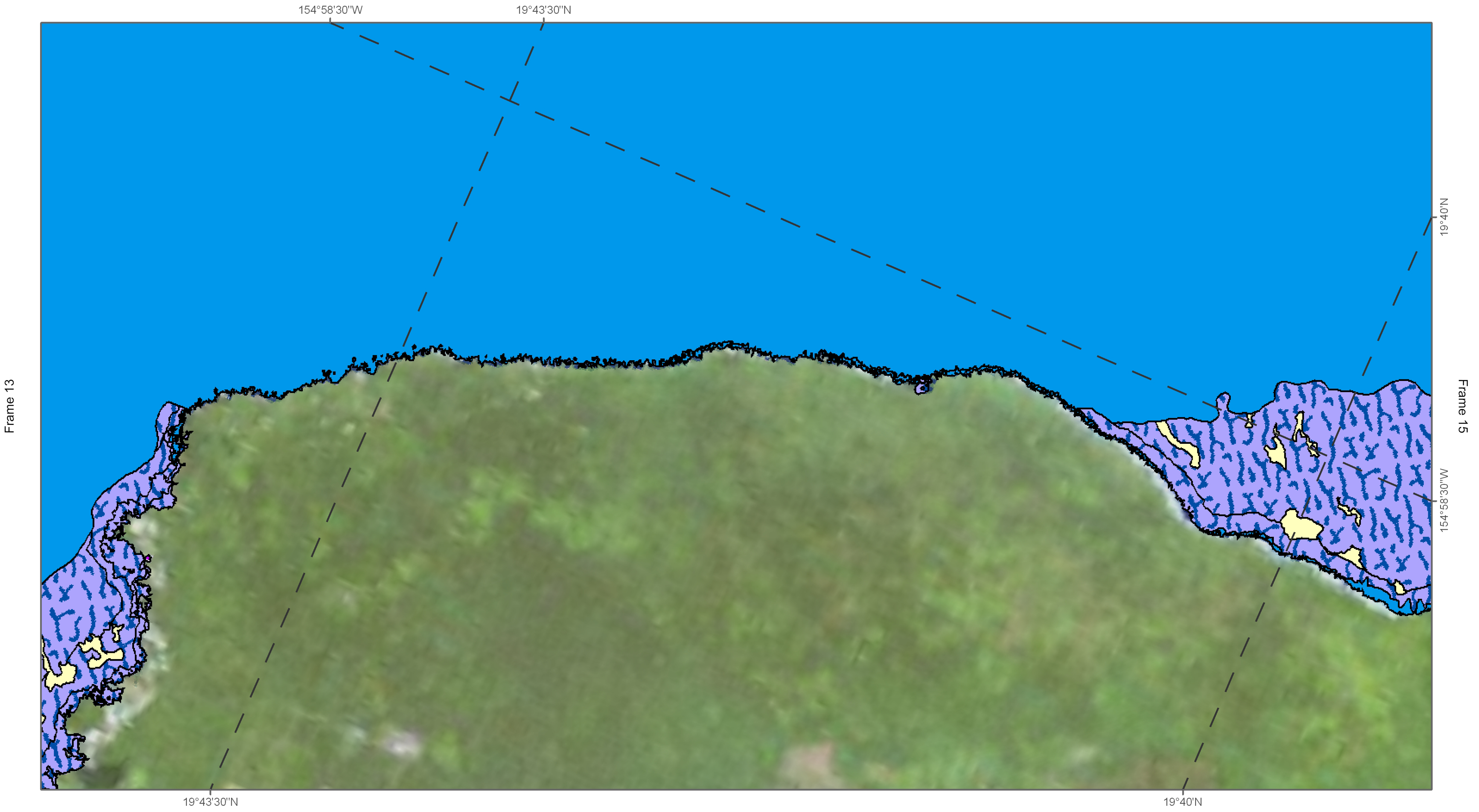
□ Minimum Mapping Unit (1 Acre)

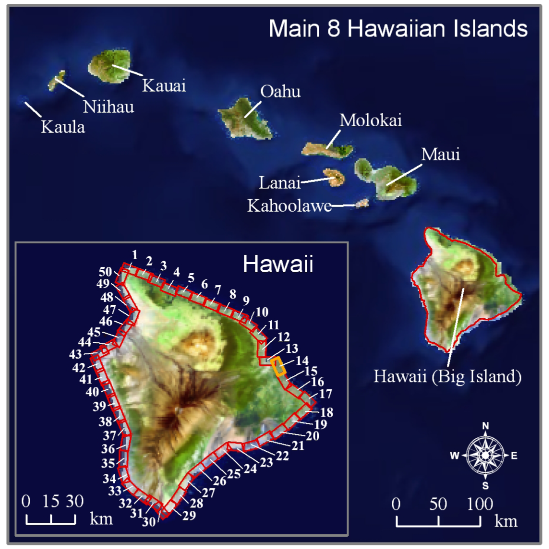
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 14)


154°58'30"W
19°43'30"N
19°40'N
154°58'30"W
Frame 13
Frame 15
19°43'30"N
19°40'N
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km

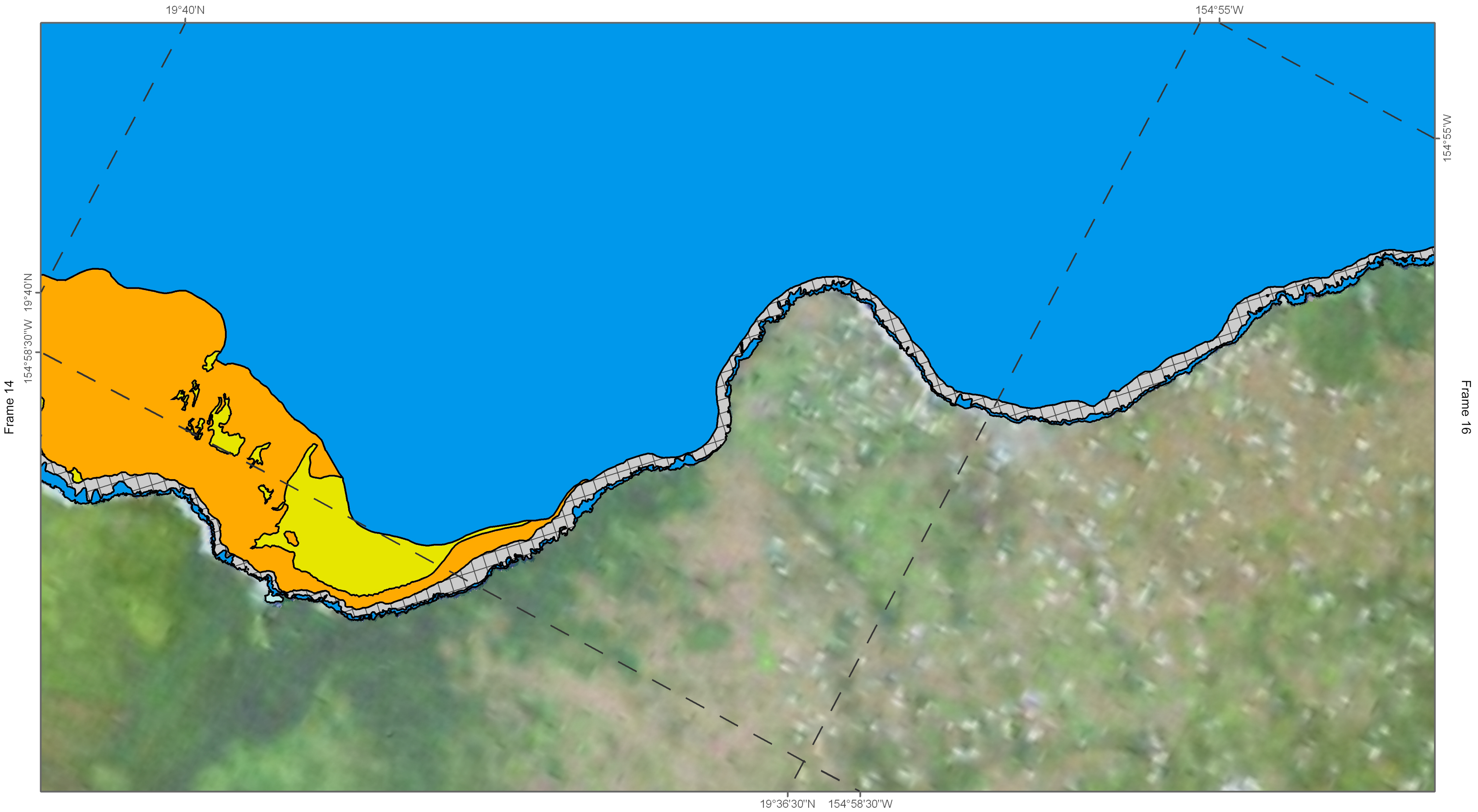
Geomorphological Structure Types

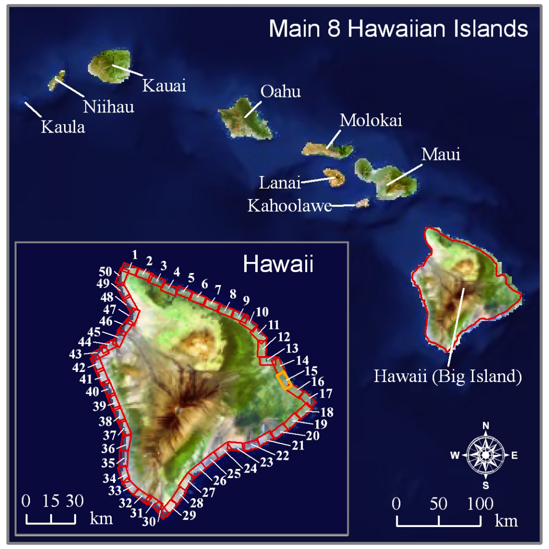
- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 15)


19°40'N
154°55'W
154°55'W
19°40'N
154°58'30"W
Frame 14
Frame 16
19°36'30"N
154°58'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

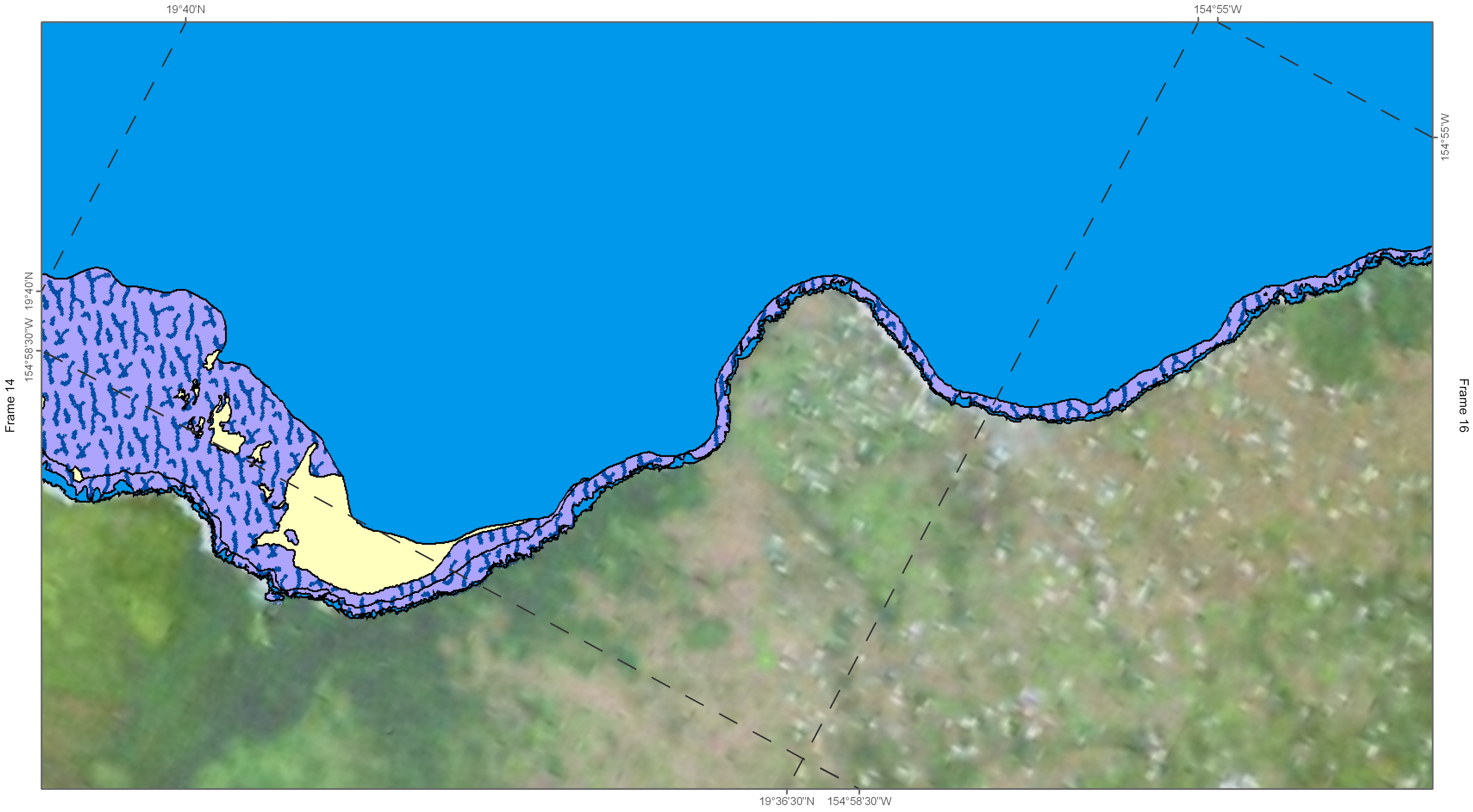
☐ Minimum Mapping Unit (1 Acre)

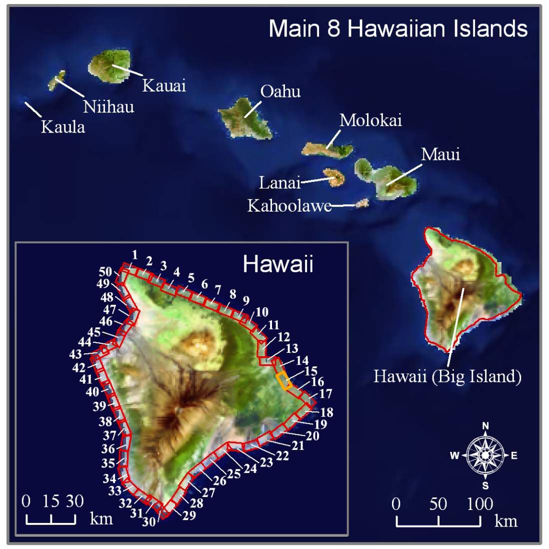
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 15)


19°40'N
154°55'W
154°55'W
154°58'30"W 19°40'N
Frame 14
Frame 16
19°36'30"N
154°58'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
Hawaii (Big Island)
N
W
E
S
0 50 100 km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

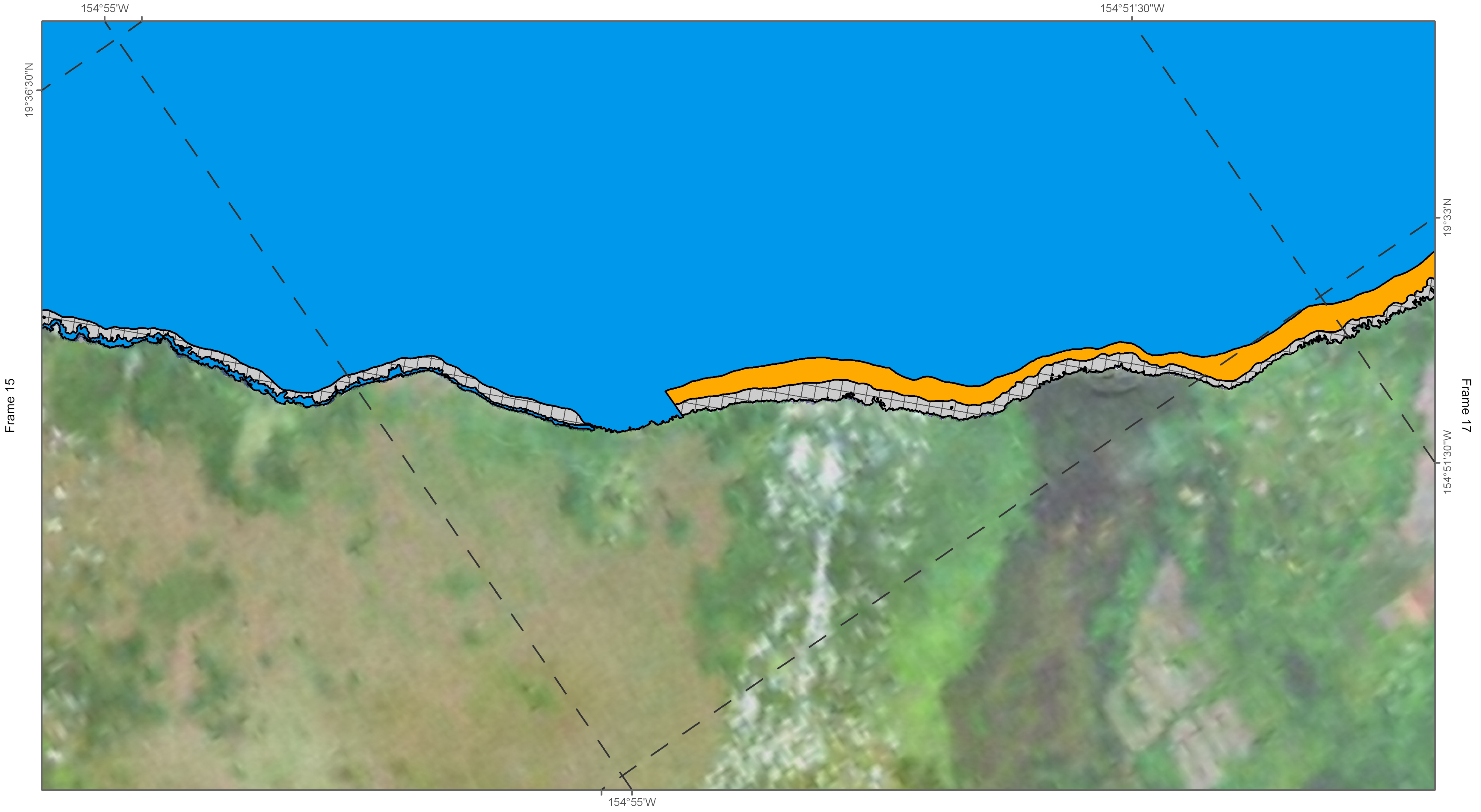
□ Minimum Mapping Unit (1 Acre)

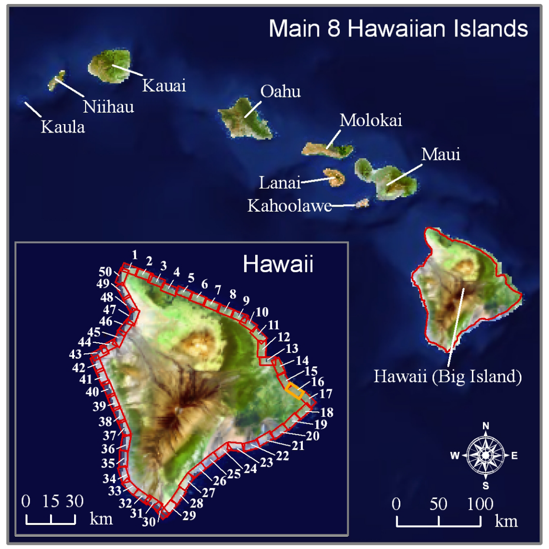
0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 16)


154°55'W
154°51'30"W
19°36'30"N
19°33'N
154°51'30"W
154°55'W
Frame 15
Frame 17


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Hawaii
0 15 30 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▨ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▨ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▨ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

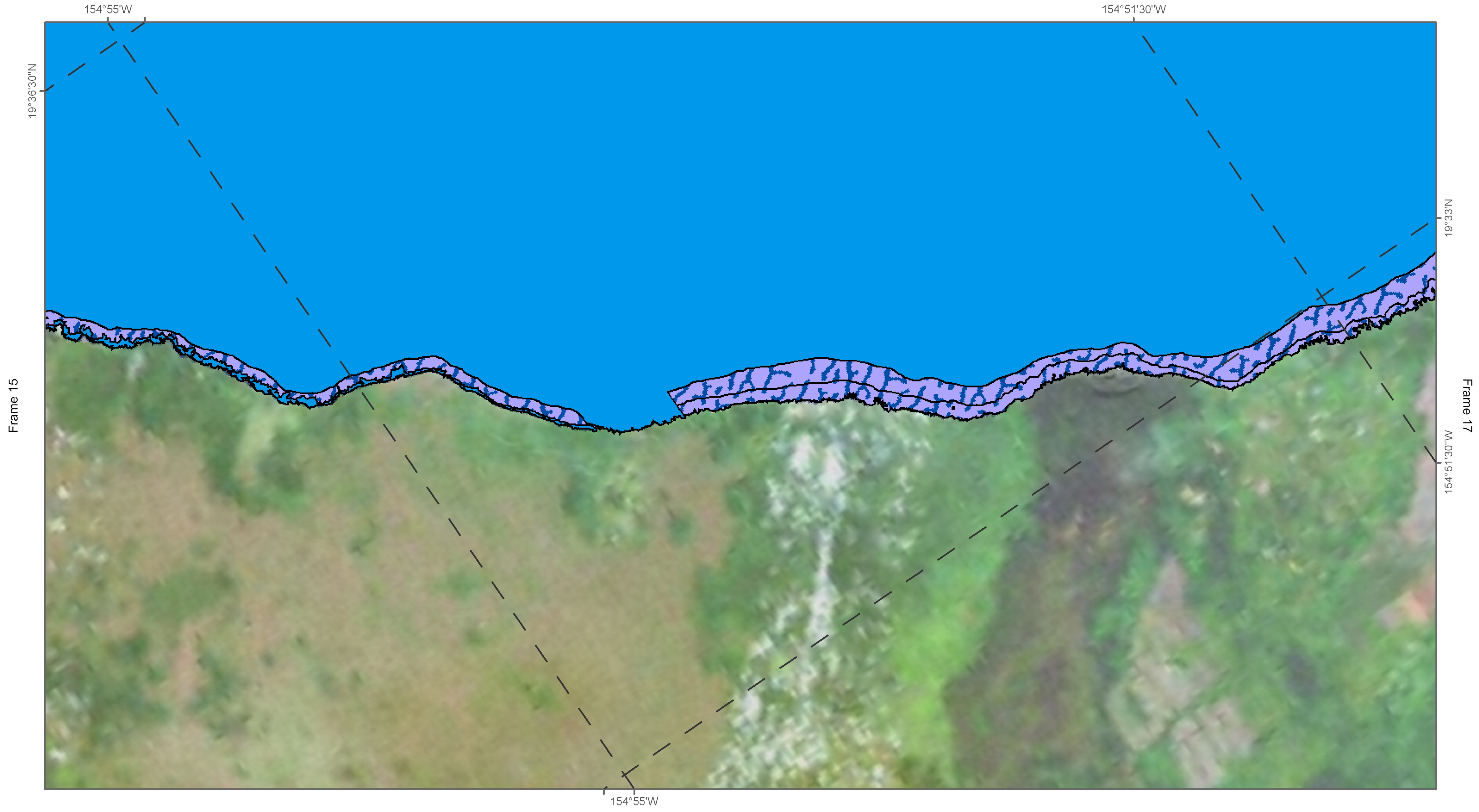
☐ Minimum Mapping Unit (1 Acre)

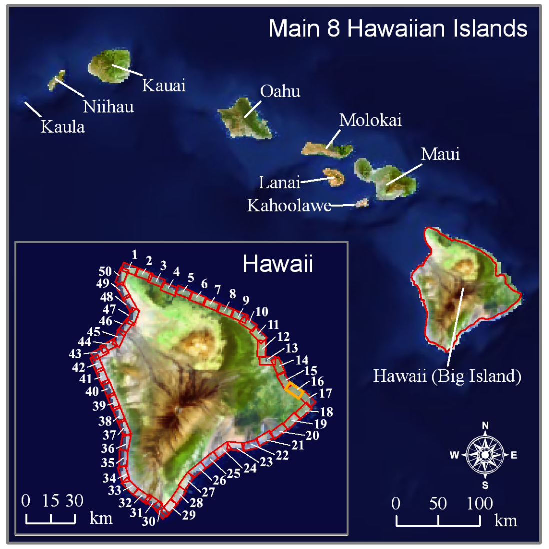
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 16)


154°55'W
154°51'30"W
19°36'30"N
19°33'N
154°51'30"W
154°55'W
Frame 15
Frame 17


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
E
S
W

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▩ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

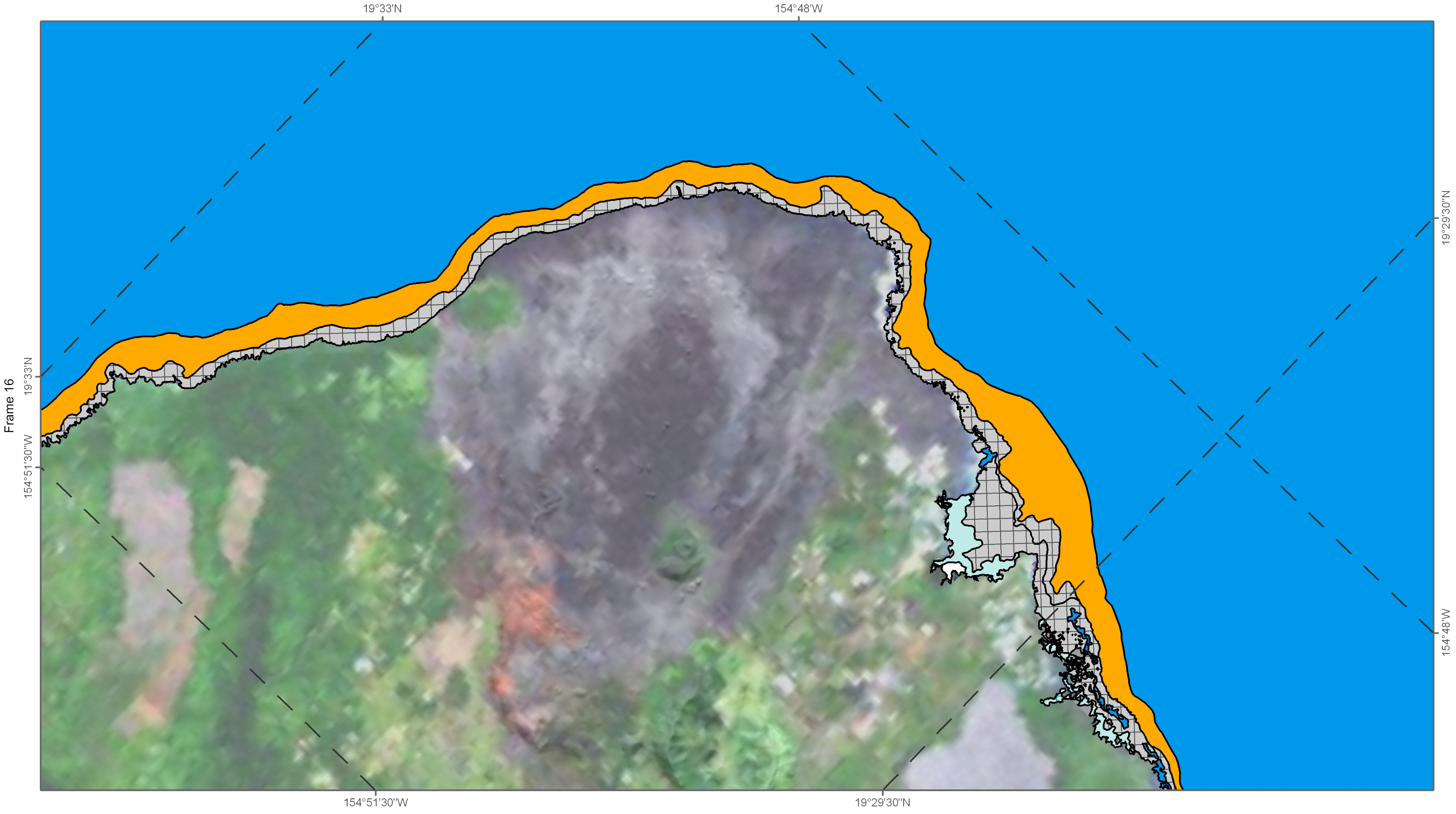
□ Minimum Mapping Unit (1 Acre)

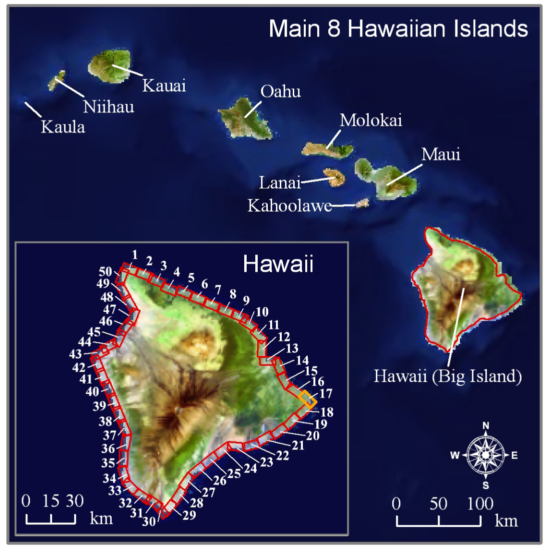
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 17)


19°33'N
154°48'W
19°29'30"N
154°48'W
154°51'30"W
19°29'30"N
Frame 16
19°33'N
154°51'30"W
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N S E W

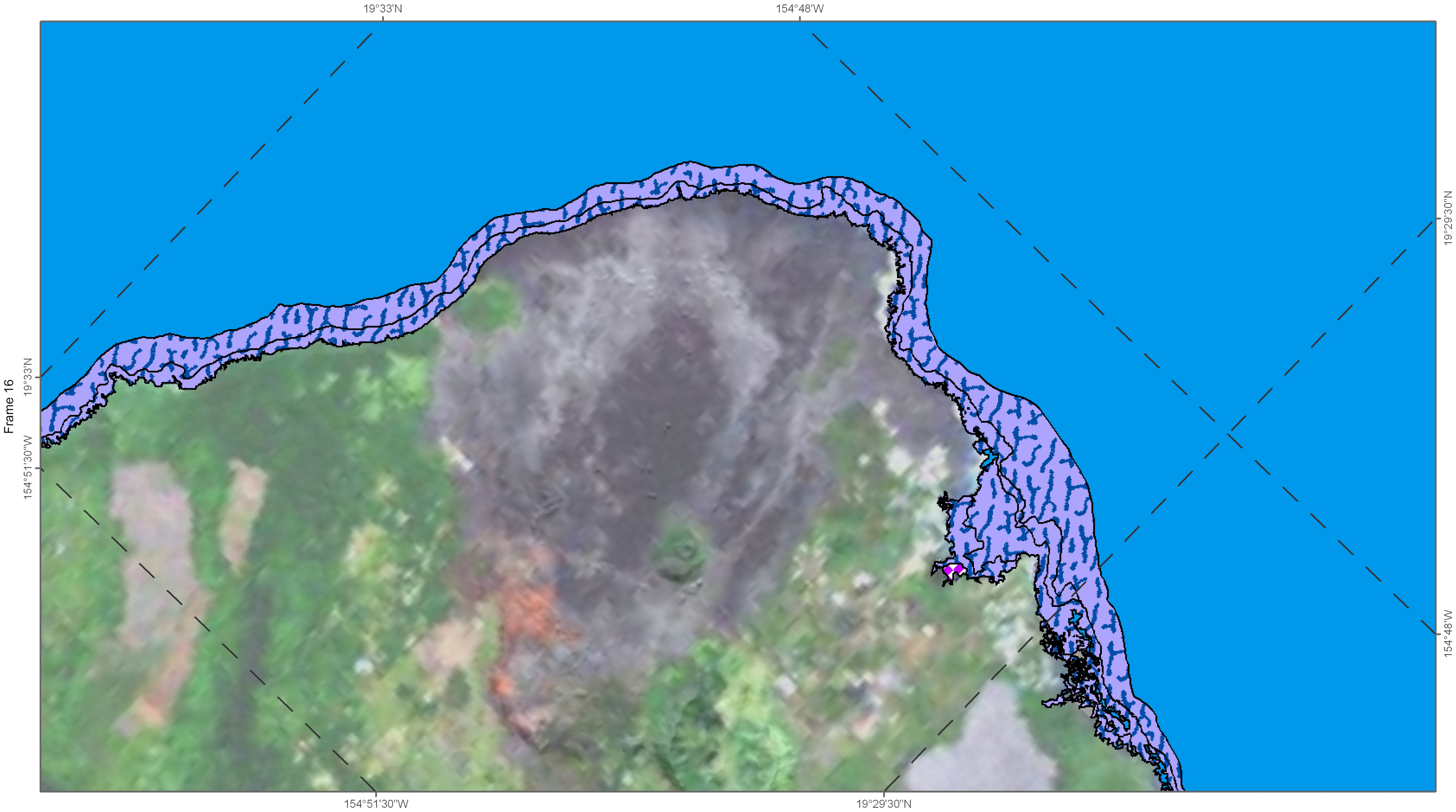
Biological Cover Types

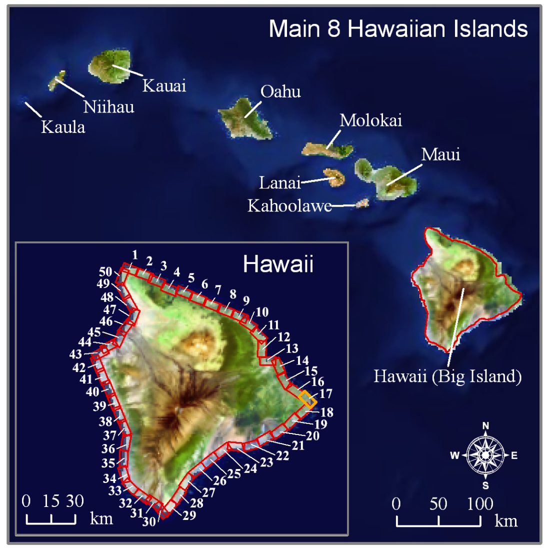
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ◻ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ◻ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ◻ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 17)


19°33'N
154°48'W
19°29'30"N
154°48'W
Frame 16
19°33'N
154°51'30"W
154°51'30"W
19°29'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

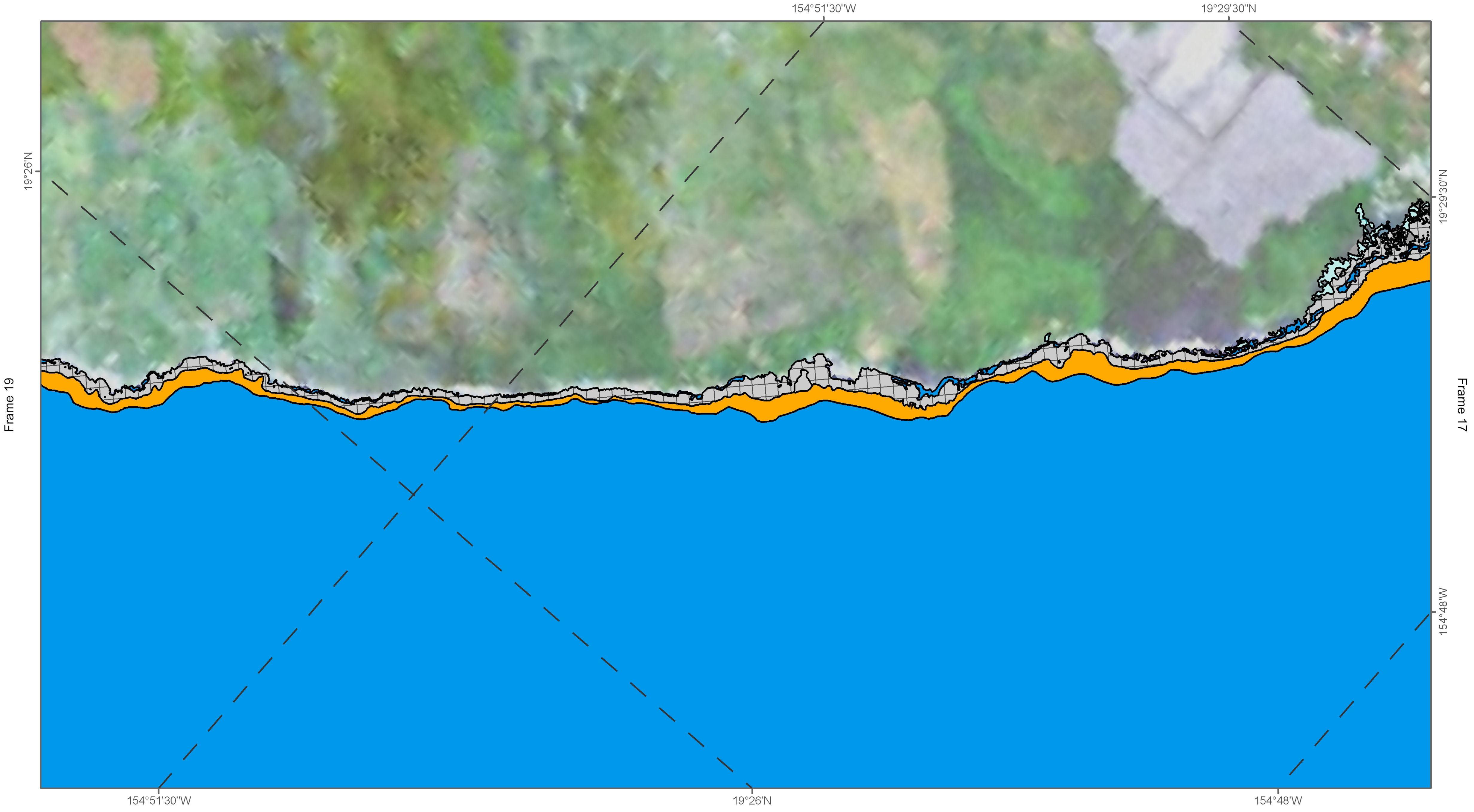
□ Minimum Mapping Unit (1 Acre)

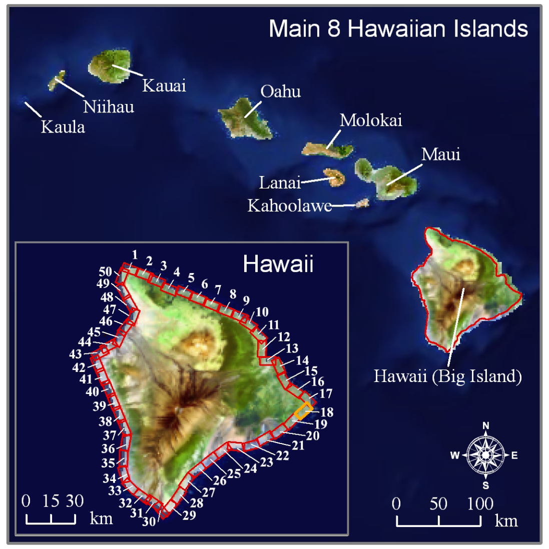
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 18)


154°51'30"W
19°29'30"N
19°26'N
19°29'30"N
Frame 19
Frame 17
154°48'W
154°51'30"W
19°26'N
154°48'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- 🟨 Seagrass 10%-<50%
- 🟦 Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- 🟦 Macroalgae 90%-100%
- 🟪 Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

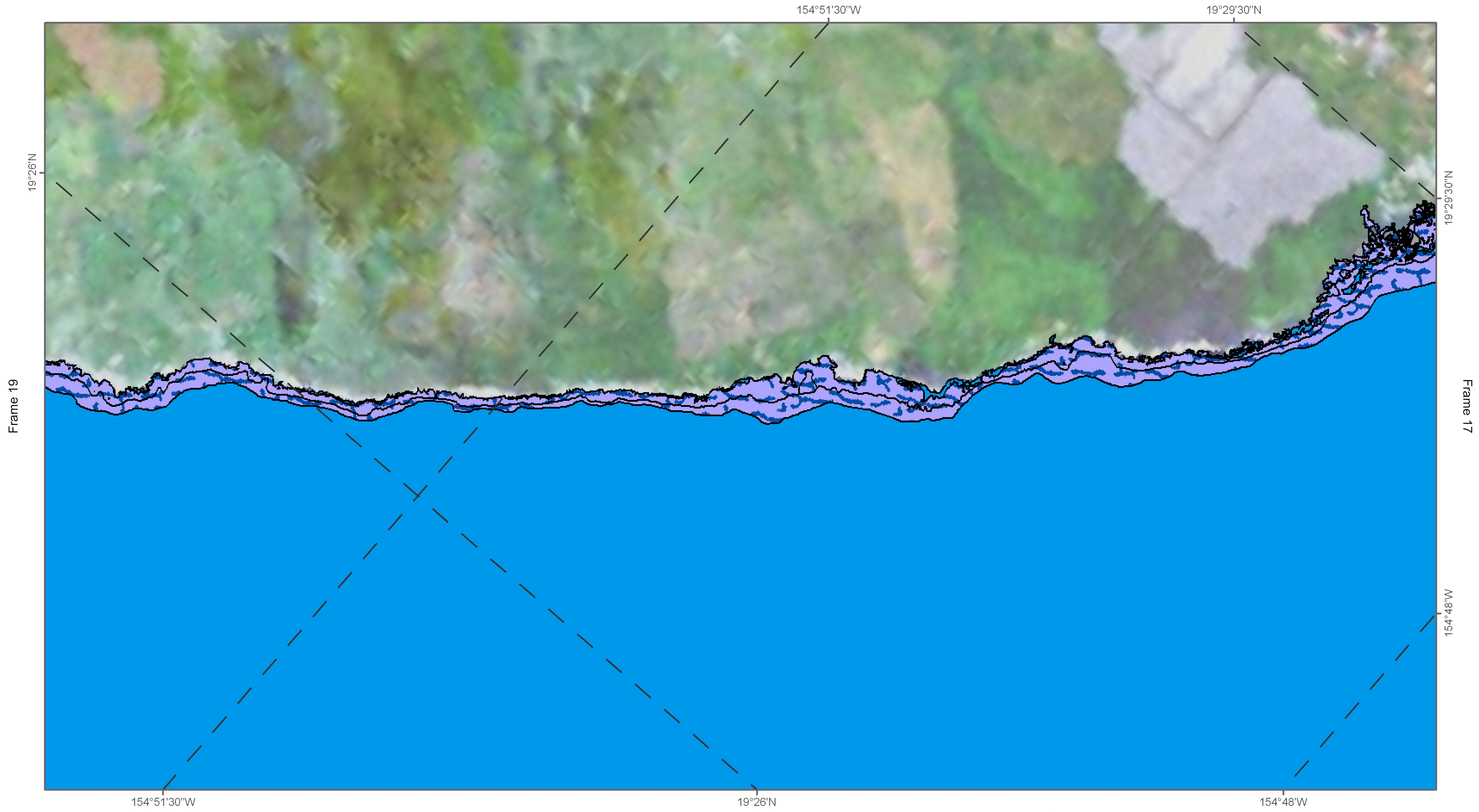
🟥 Minimum Mapping Unit (1 Acre)

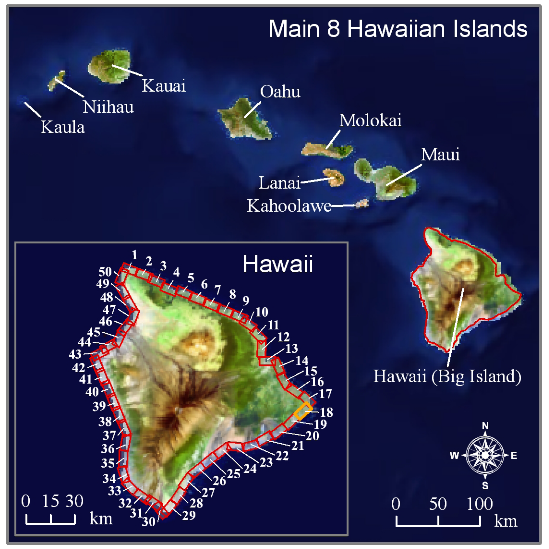
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 18)


154°51'30"W
19°29'30"N
19°26'N
19°29'30"N
Frame 19
Frame 17
154°48'W
154°51'30"W
19°26'N
154°48'W
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
Hawaii (Big Island)
N
W
E
S
0 50 100 km

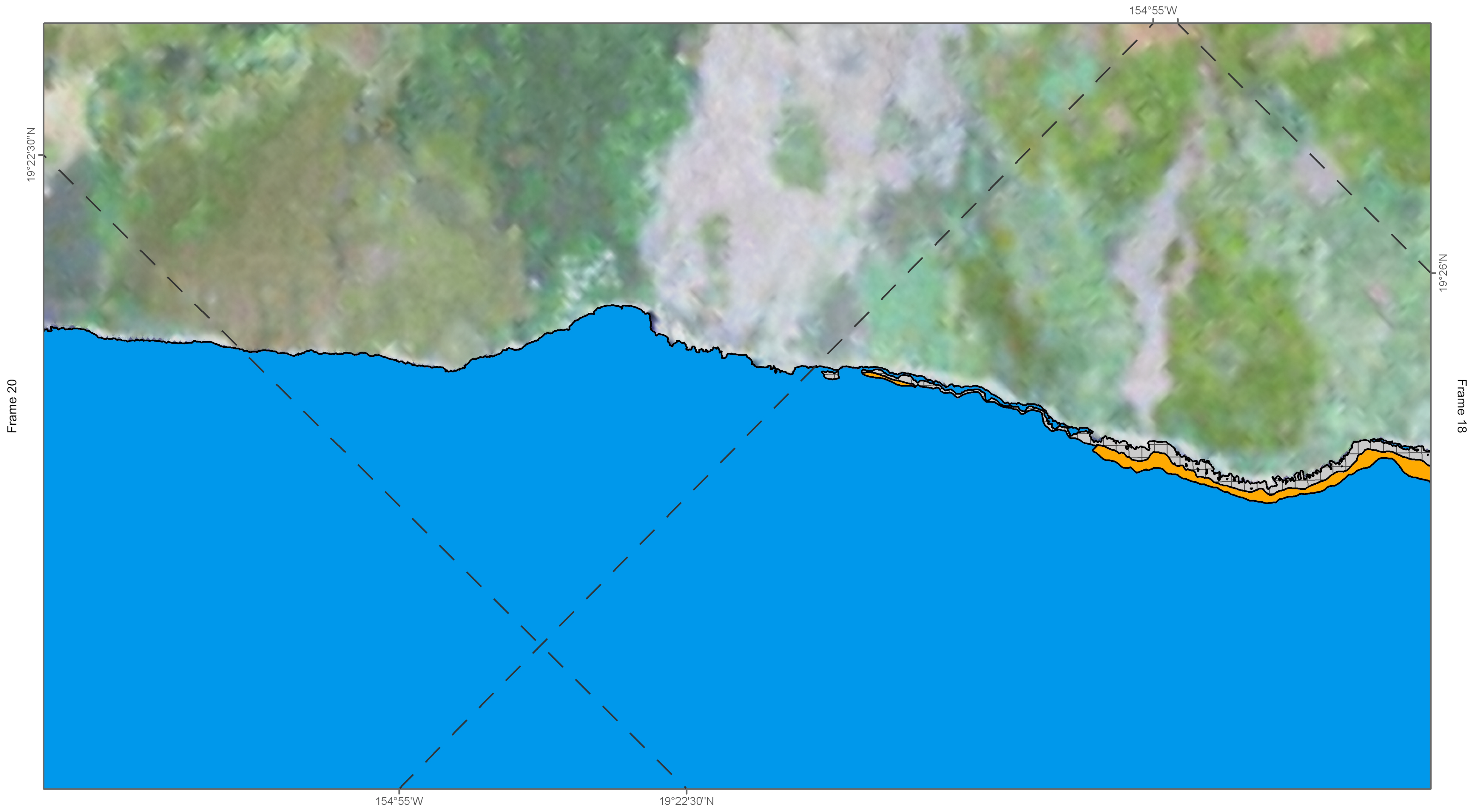
Geomorphological Structure Types

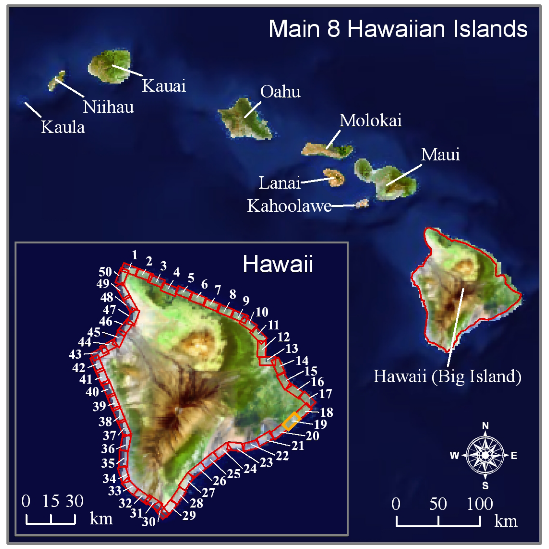
- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 19)


154°55'W
19°22'30"N
19°26'N
Frame 20
Frame 18
154°55'W
19°22'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ☐ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ☐ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ☐ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

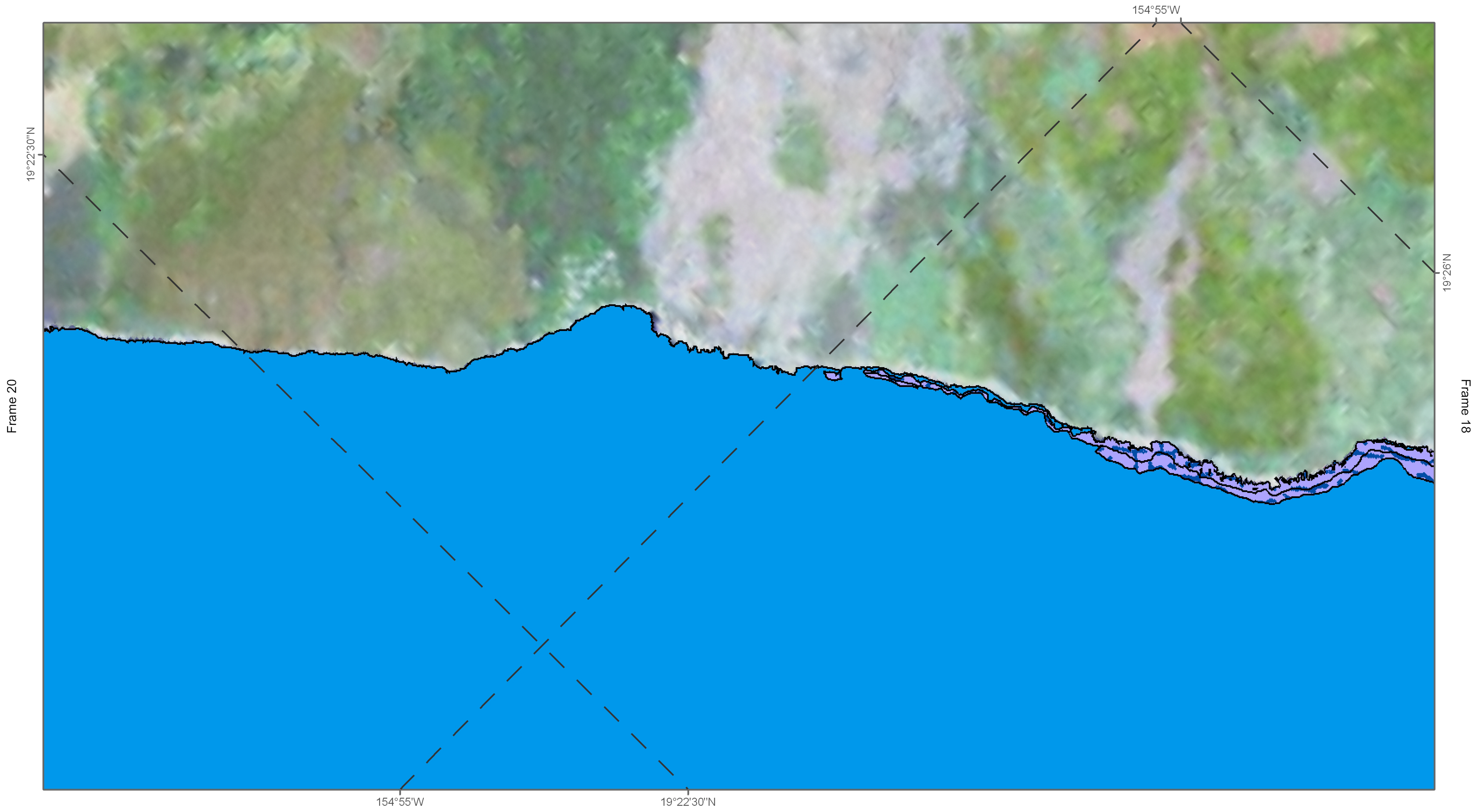
☐ Minimum Mapping Unit (1 Acre)

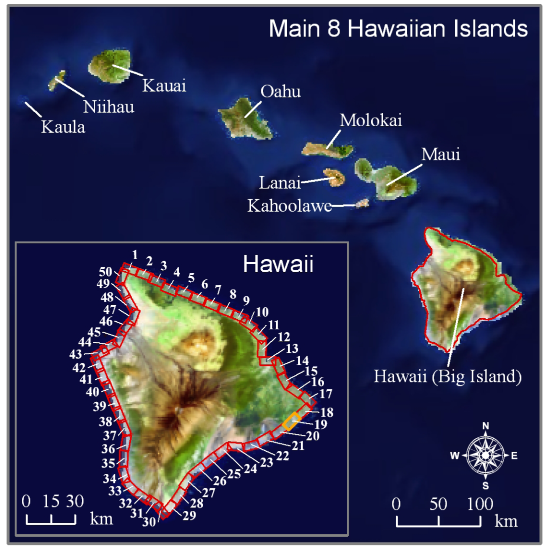
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 19)


154°55'W
19°22'30"N
19°26'N
Frame 20
Frame 18
154°55'W
19°22'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
S
E
W

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ■ Mud
- □ Sand
- 🟦 Unknown

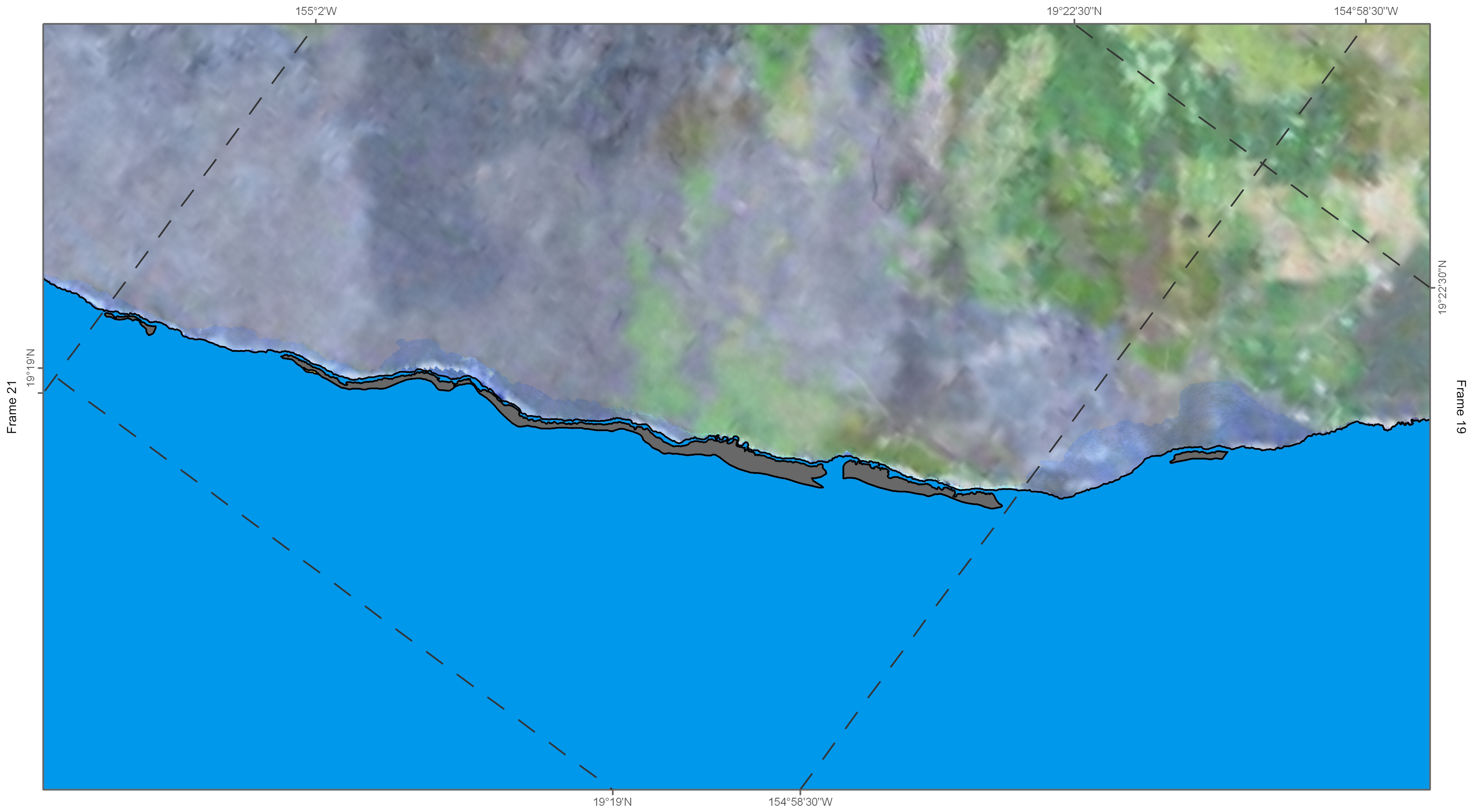
□ Minimum Mapping Unit (1 Acre)

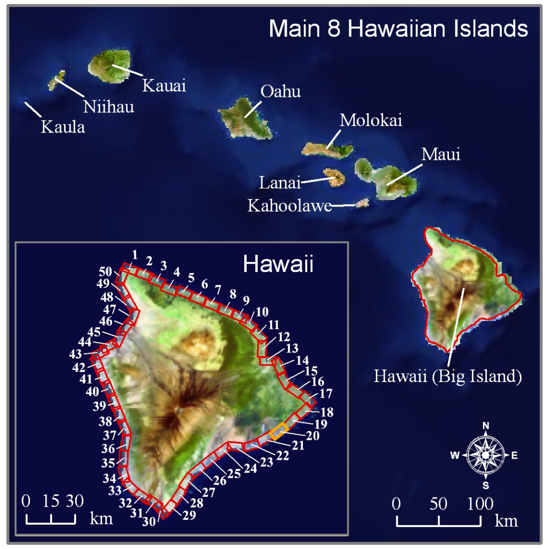
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 20)


155°2'W
19°22'30"N
154°58'30"W
19°19'N
Frame 21
19°22'30"N
Frame 19
19°19'N
154°58'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
N E S W
0 50 100 km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

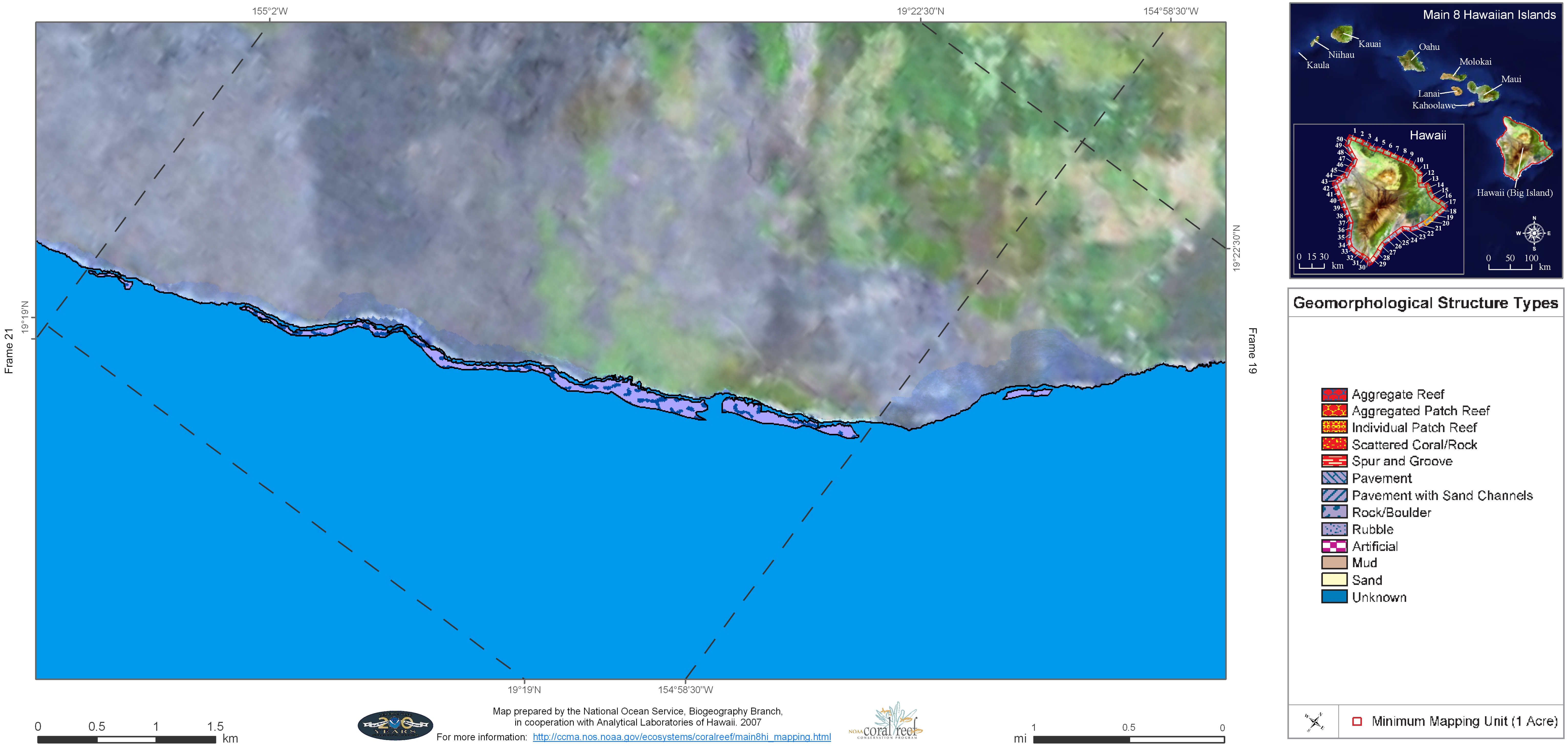
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

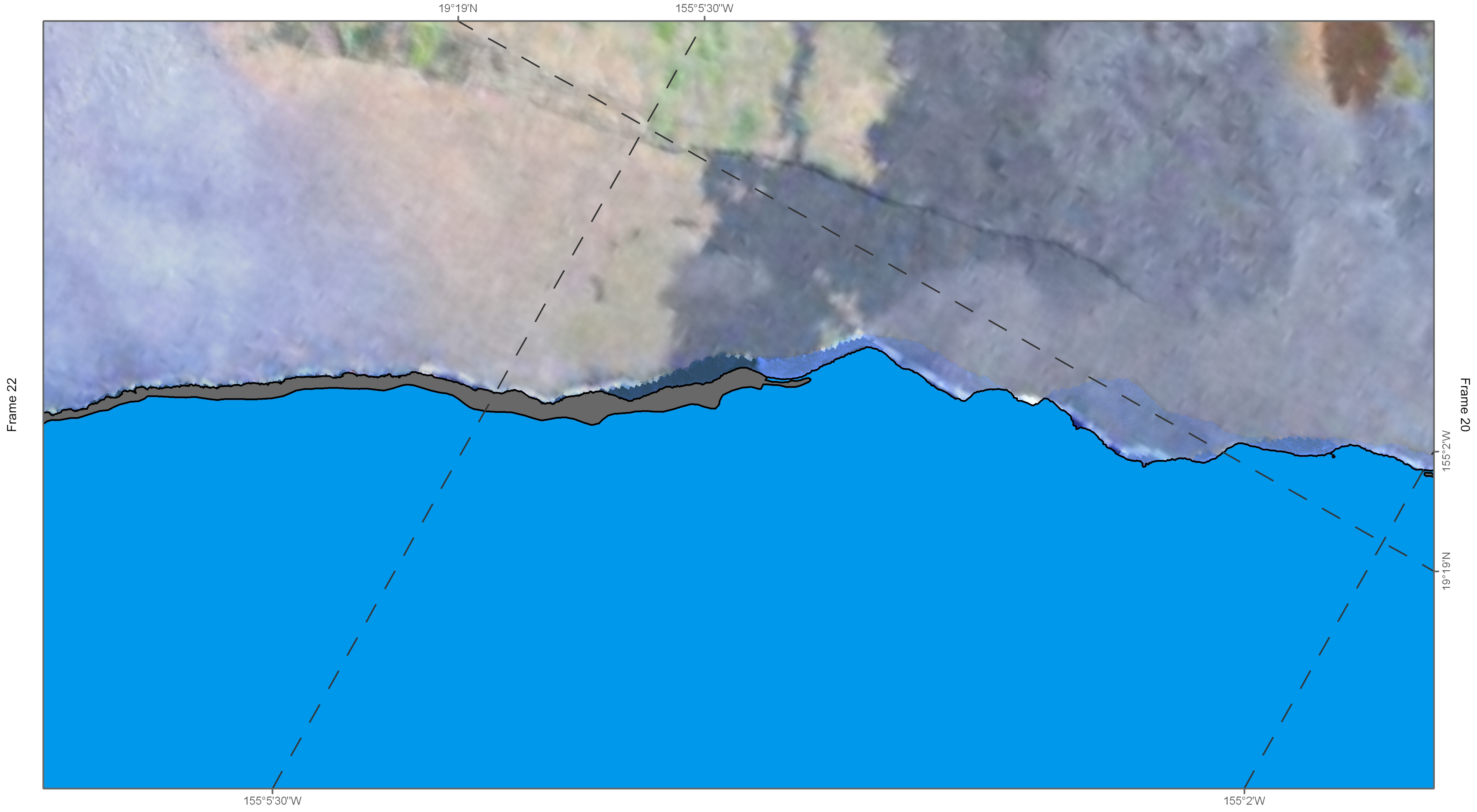
Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 20)

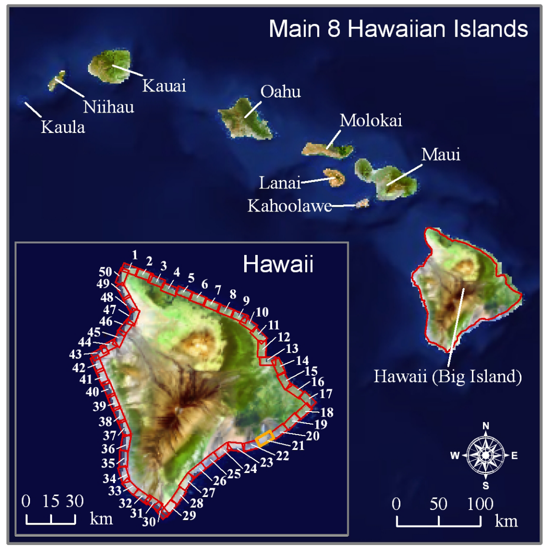


155°2'W
19°22'30"N
154°58'30"W
19°22'30"N
Frame 19
19°19'N
Frame 21
19°19'N
154°58'30"W
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Hawaii
0 15 30 km
0 50 100 km
N
E
S
W
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)
0 0.5 1 1.5 km
1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 21)


19°19'N
155°5'30"W
Frame 22
Frame 20
155°2'W
19°19'N
155°5'30"W
155°2'W
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
E
S
W

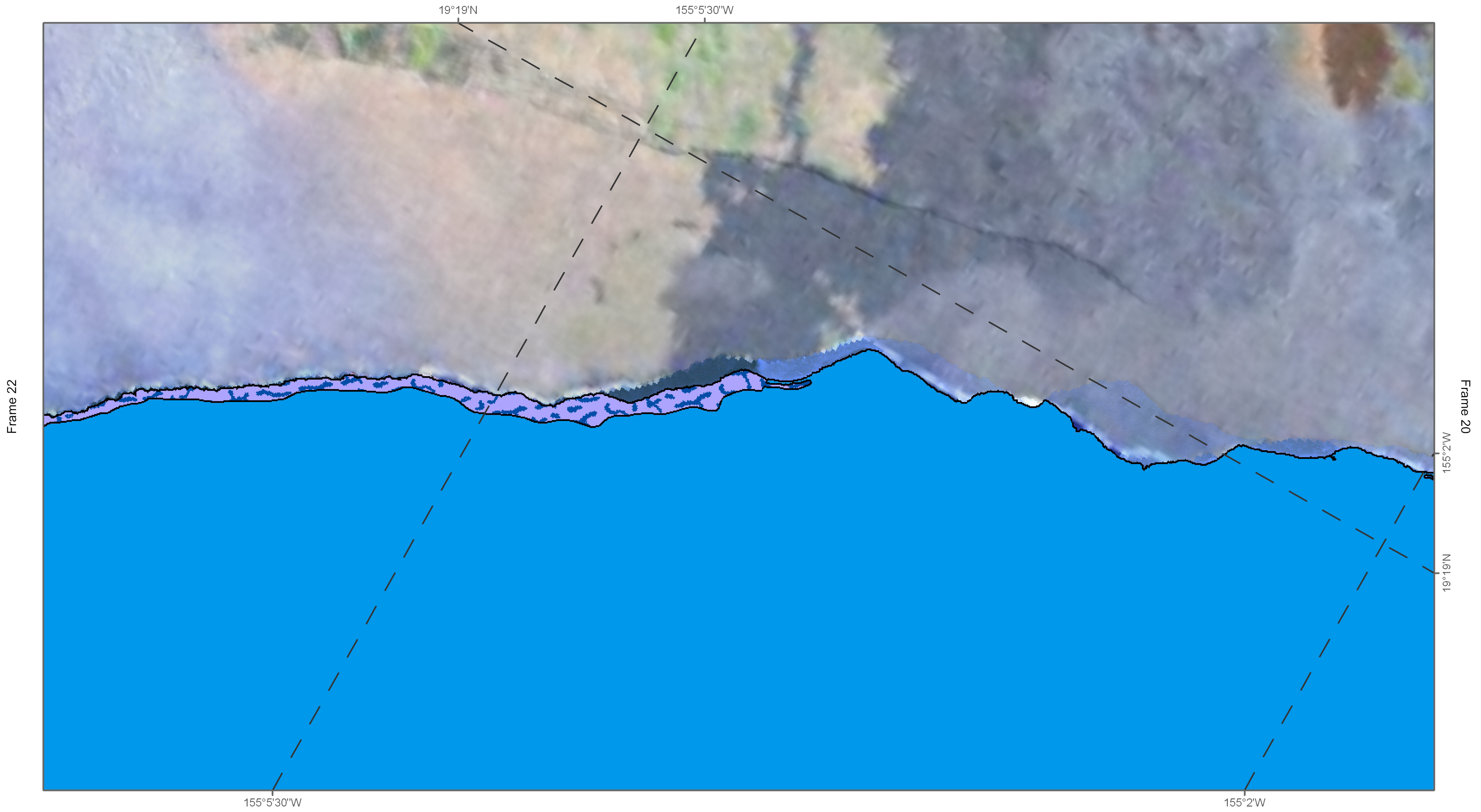
Biological Cover Types

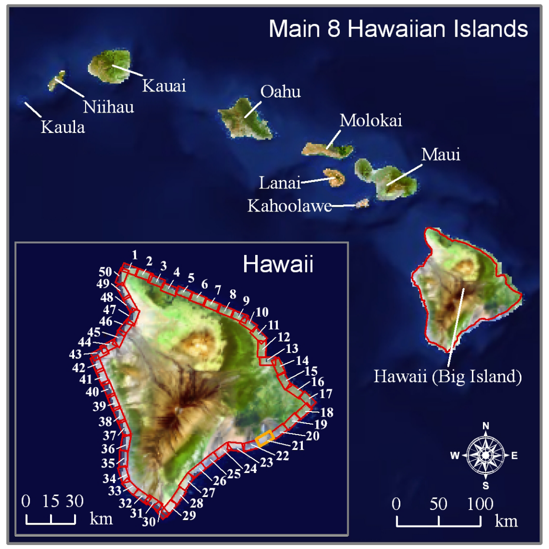
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 21)


19°19'N
155°5'30"W
Frame 22
Frame 20
155°2'W
19°19'N
155°5'30"W
155°2'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- ⬜ Sand
- 🟦 Unknown

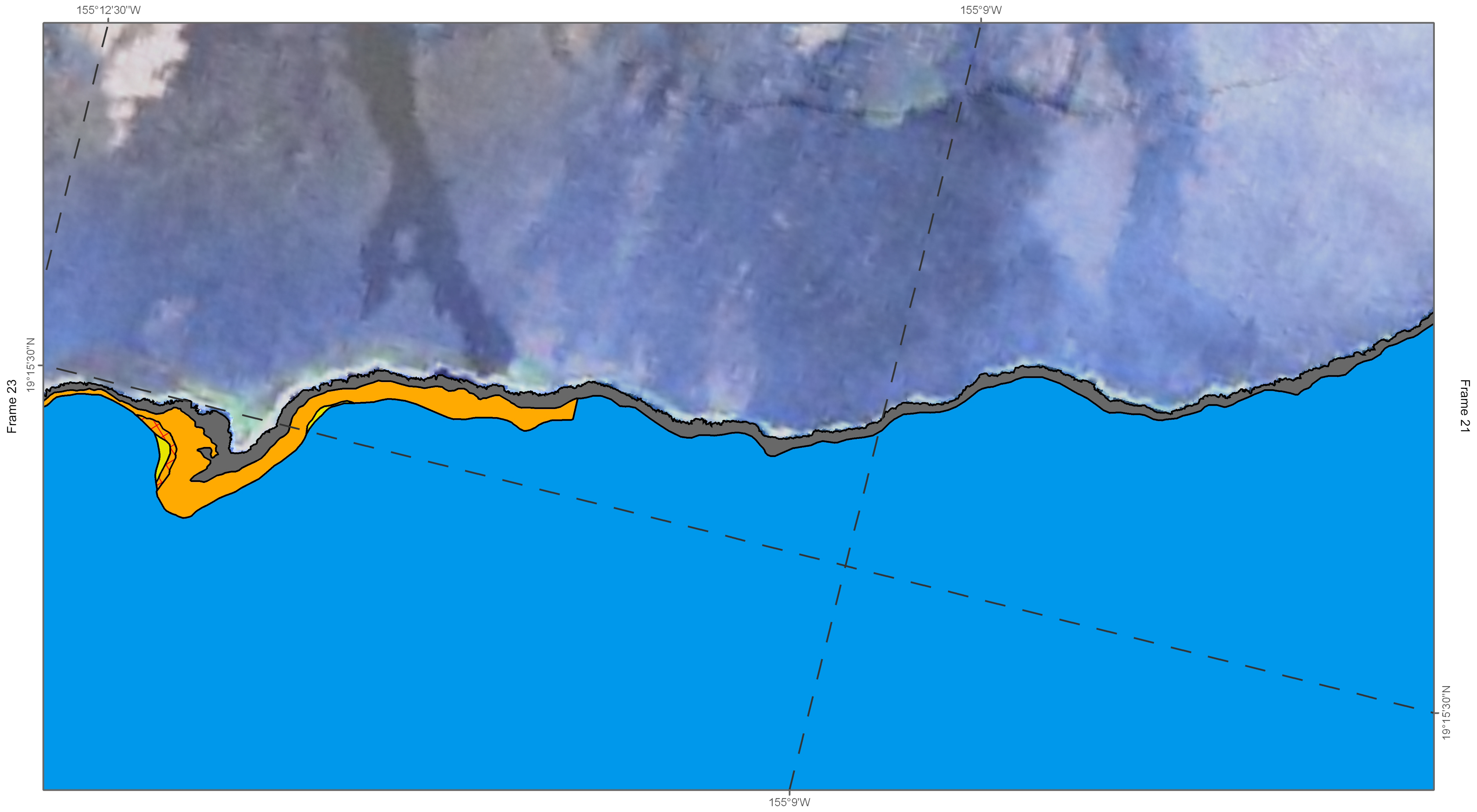
□ Minimum Mapping Unit (1 Acre)

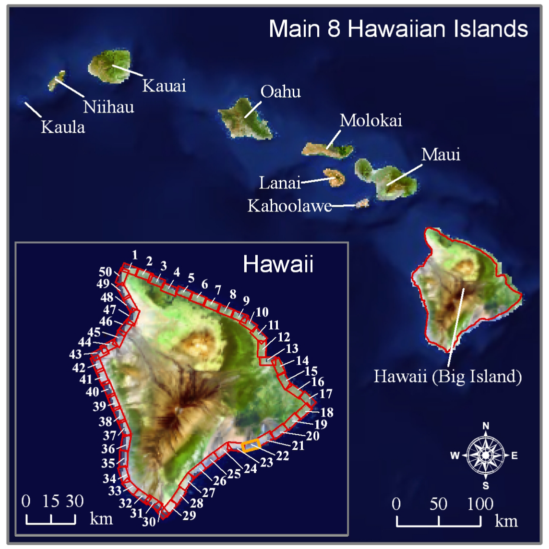
0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 22)


155°12'30"W
155°9'W
19°15'30"N
Frame 23
Frame 21
19°15'30"N
155°9'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ⬛ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

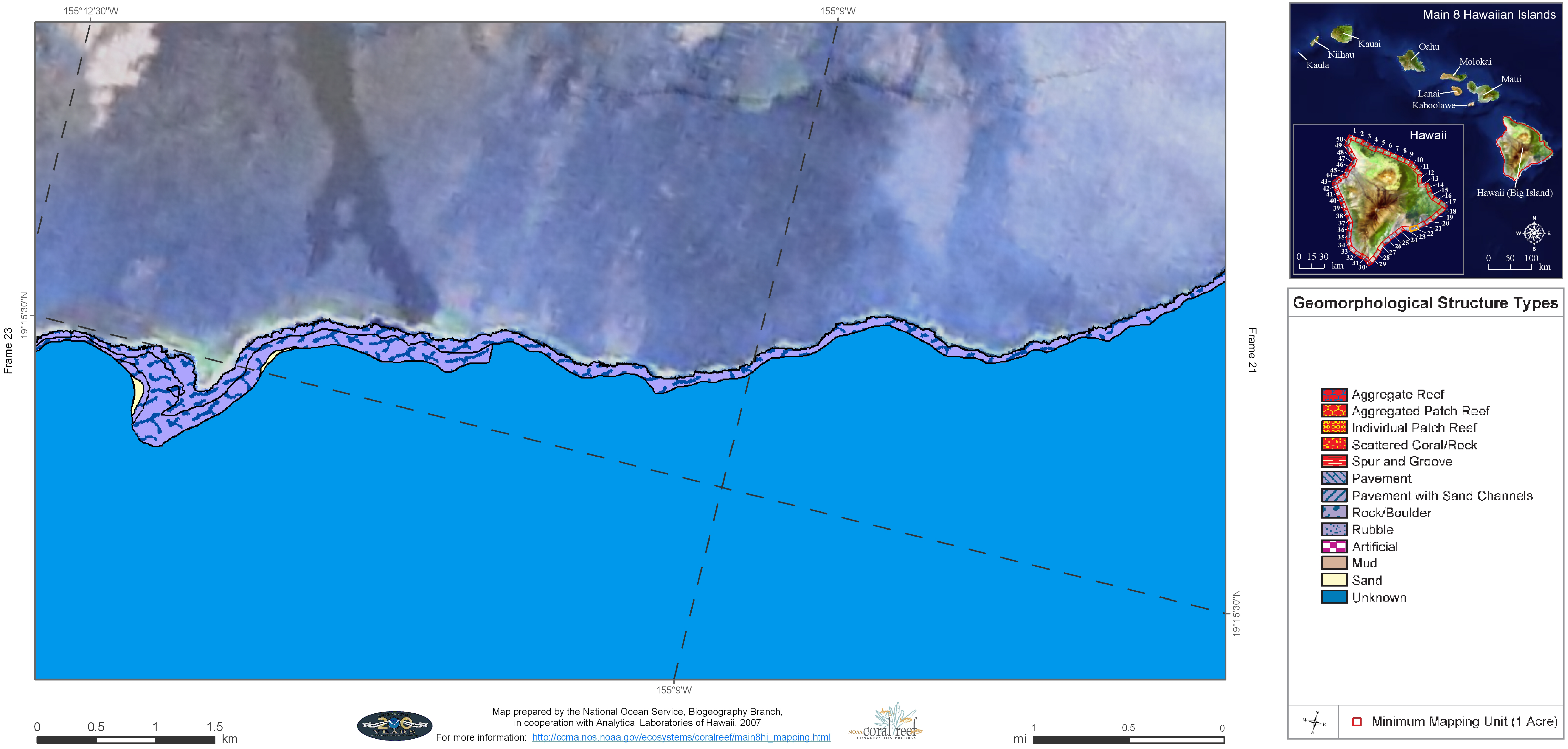
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

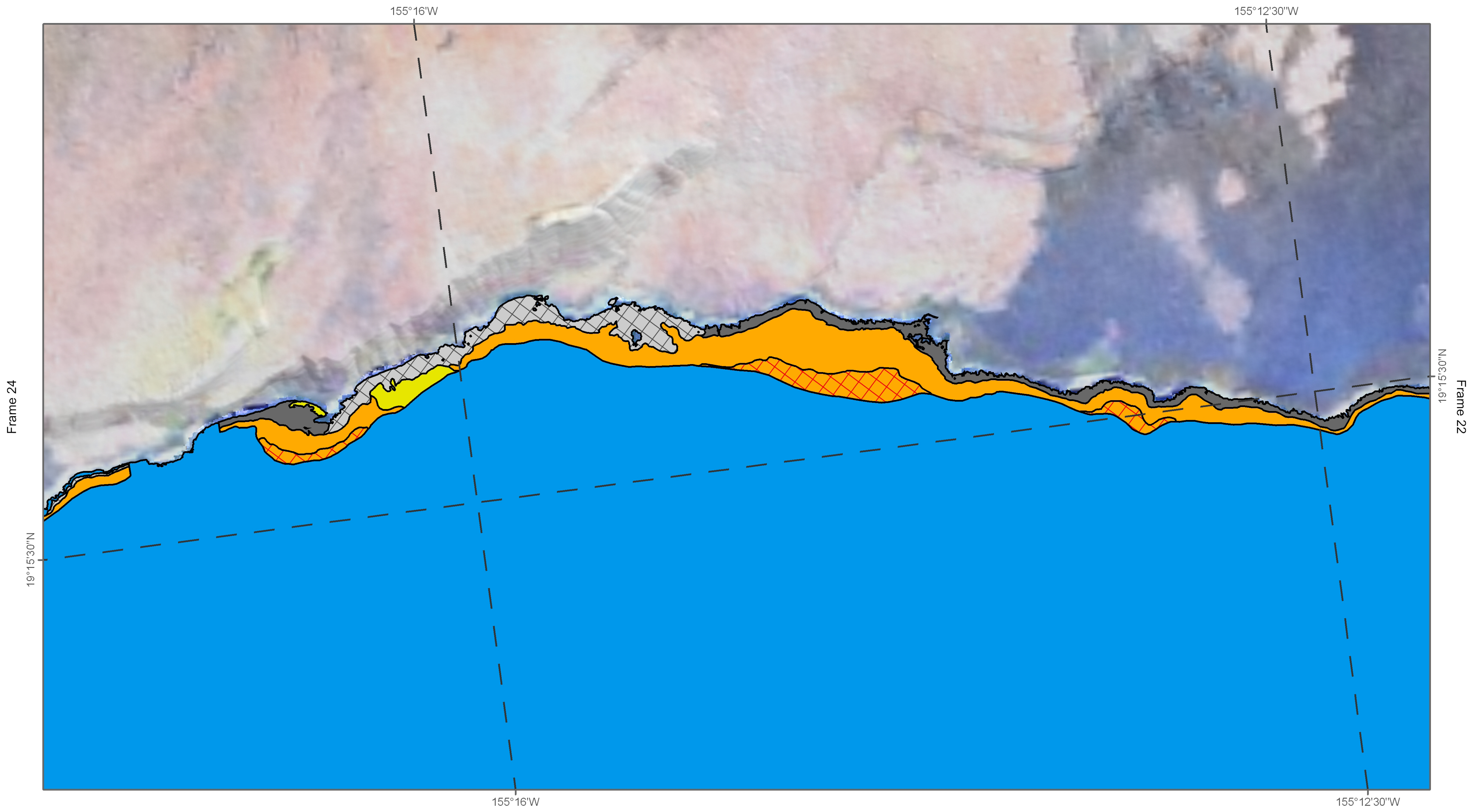
1 0.5 0 mi

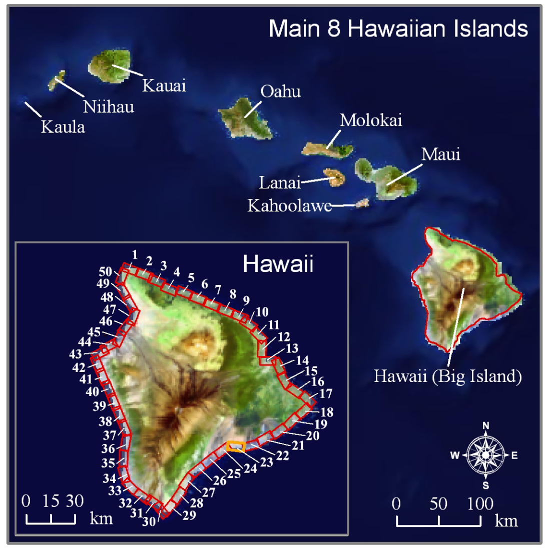
Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 22)


155°12'30"W
155°9'W
19°15'30"N
Frame 23
Frame 21
155°9'W
19°15'30"N
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)
0 0.5 1 1.5 km
1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 23)


155°16'W
155°12'30"W
Frame 24
Frame 22
19°15'30"N
19°15'30"N
155°16'W
155°12'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ⬛ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

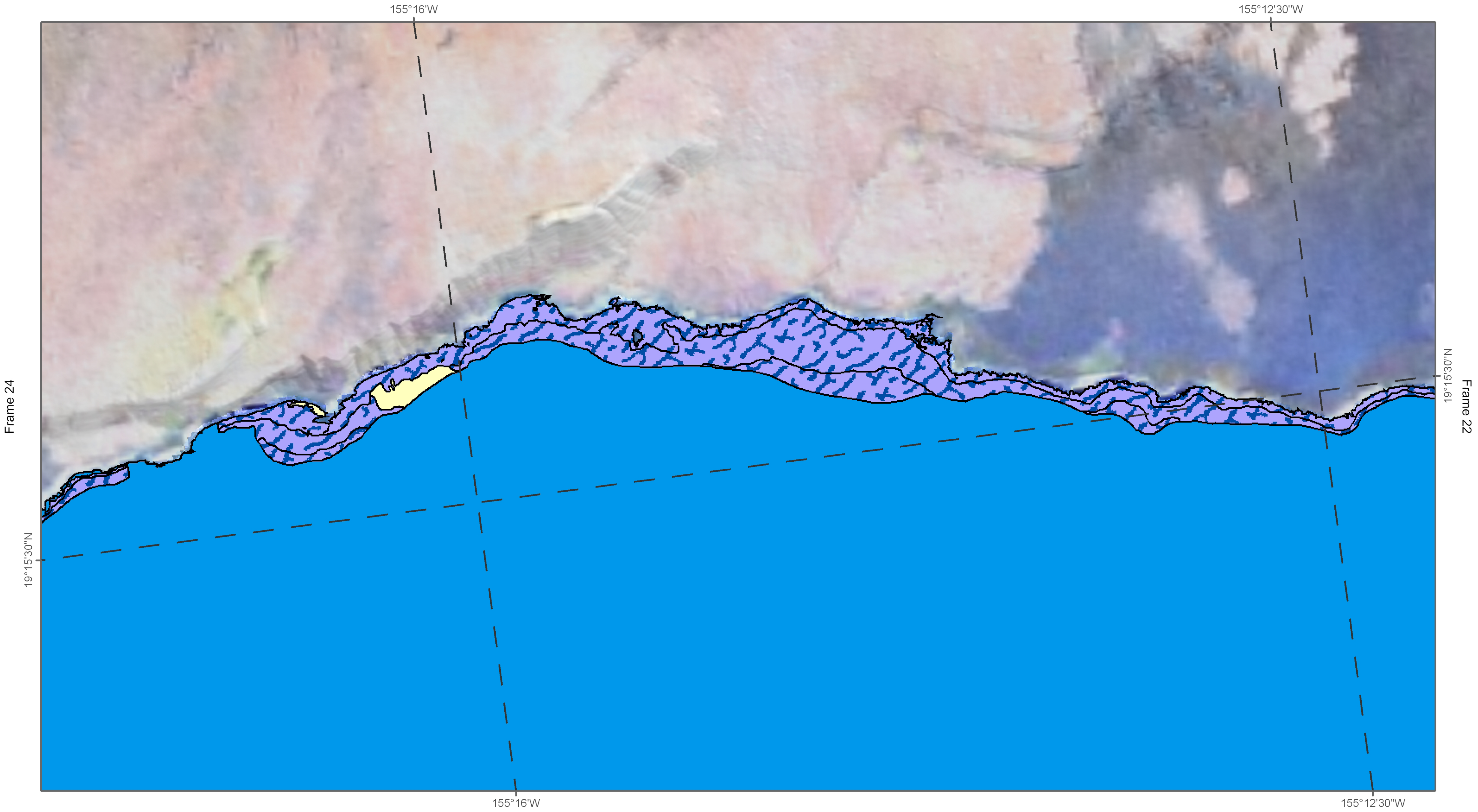
☐ Minimum Mapping Unit (1 Acre)

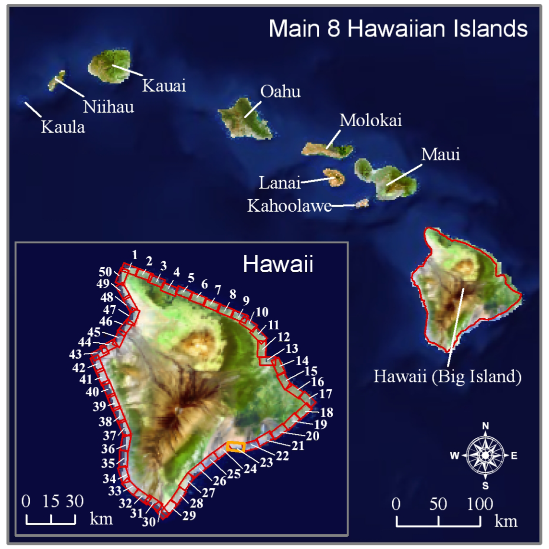
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 23)


155°16'W
155°12'30"W
Frame 24
Frame 22
19°15'30"N
19°15'30"N
155°16'W
155°12'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

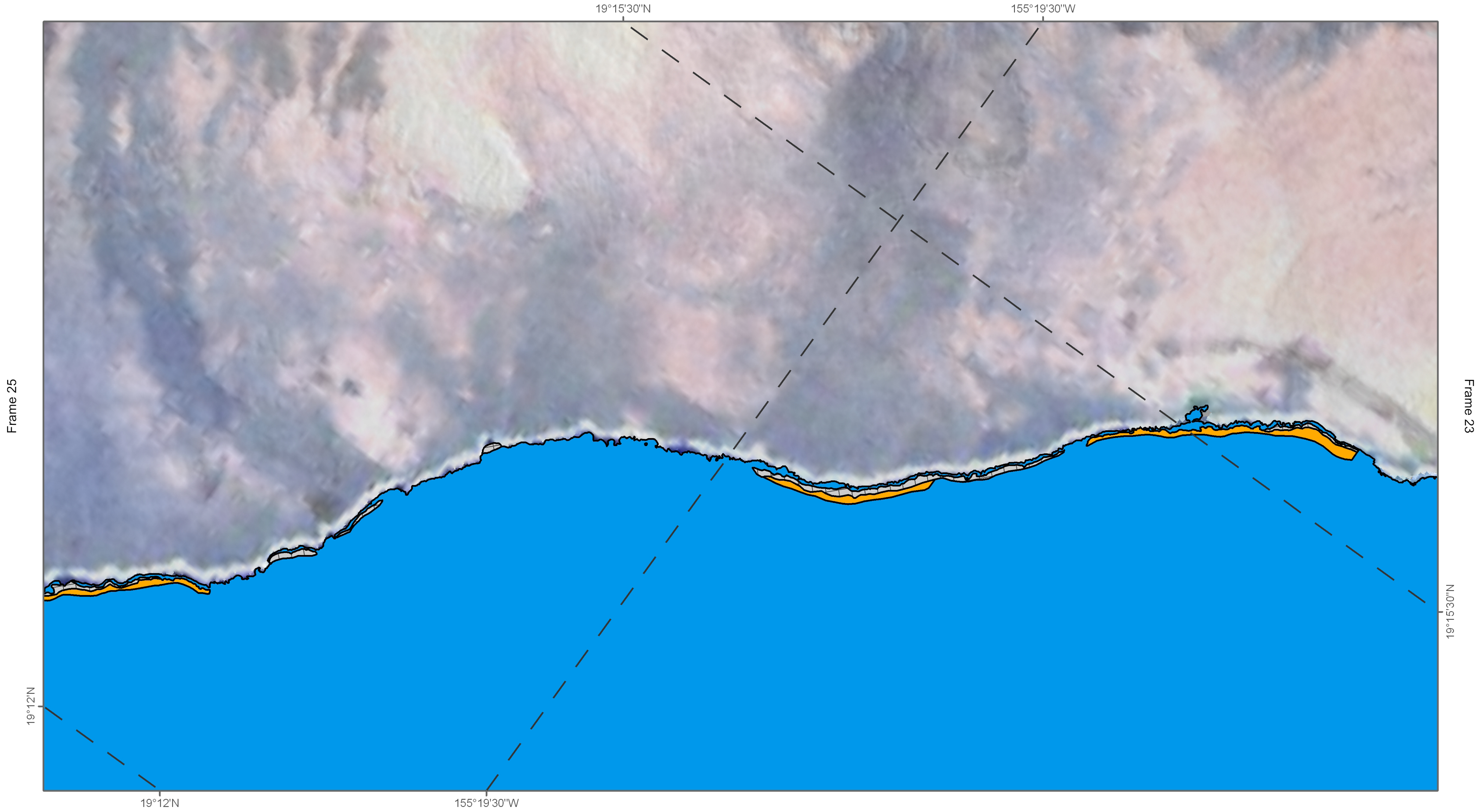
□ Minimum Mapping Unit (1 Acre)

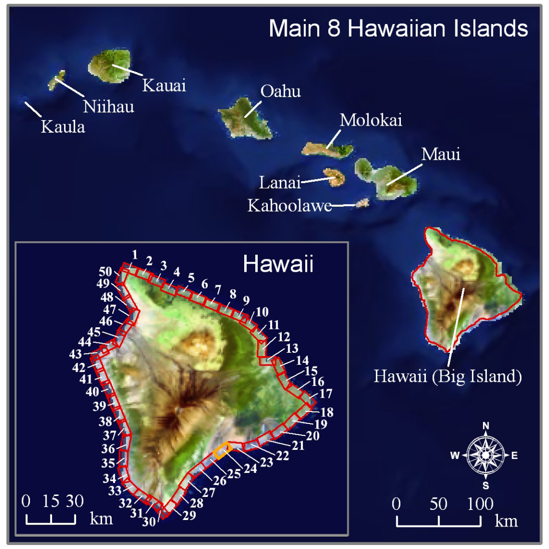
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 24)


19°15'30"N
155°19'30"W
Frame 25
Frame 23
19°15'30"N
19°12'N
19°12'N
155°19'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

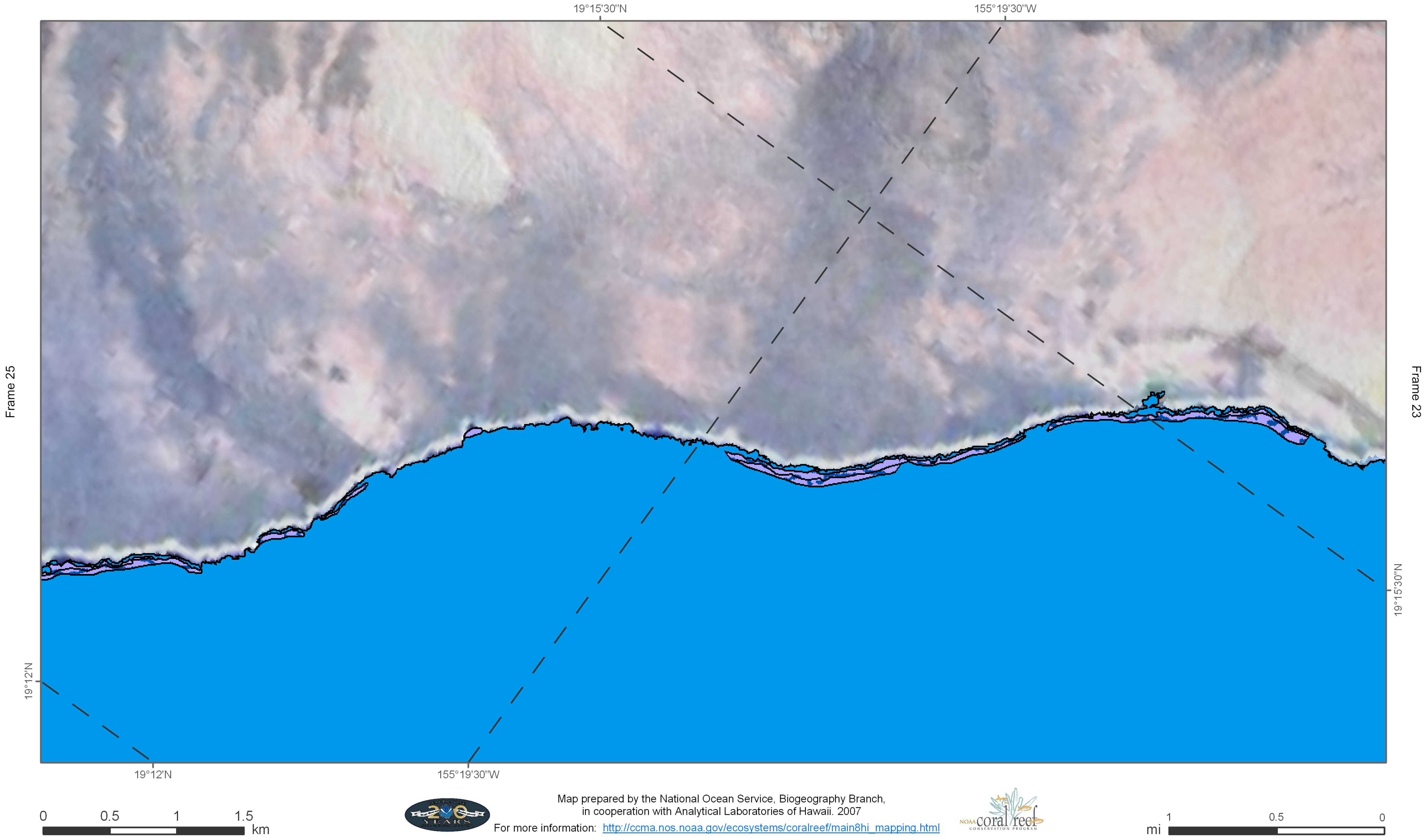
□ Minimum Mapping Unit (1 Acre)

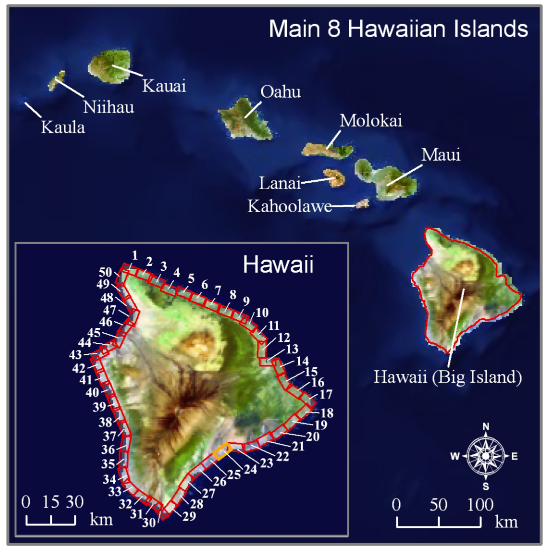
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 24)


19°15'30"N
155°19'30"W
Frame 25
Frame 23
19°15'30"N
19°12'N
19°12'N
155°19'30"W
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
W
E
S

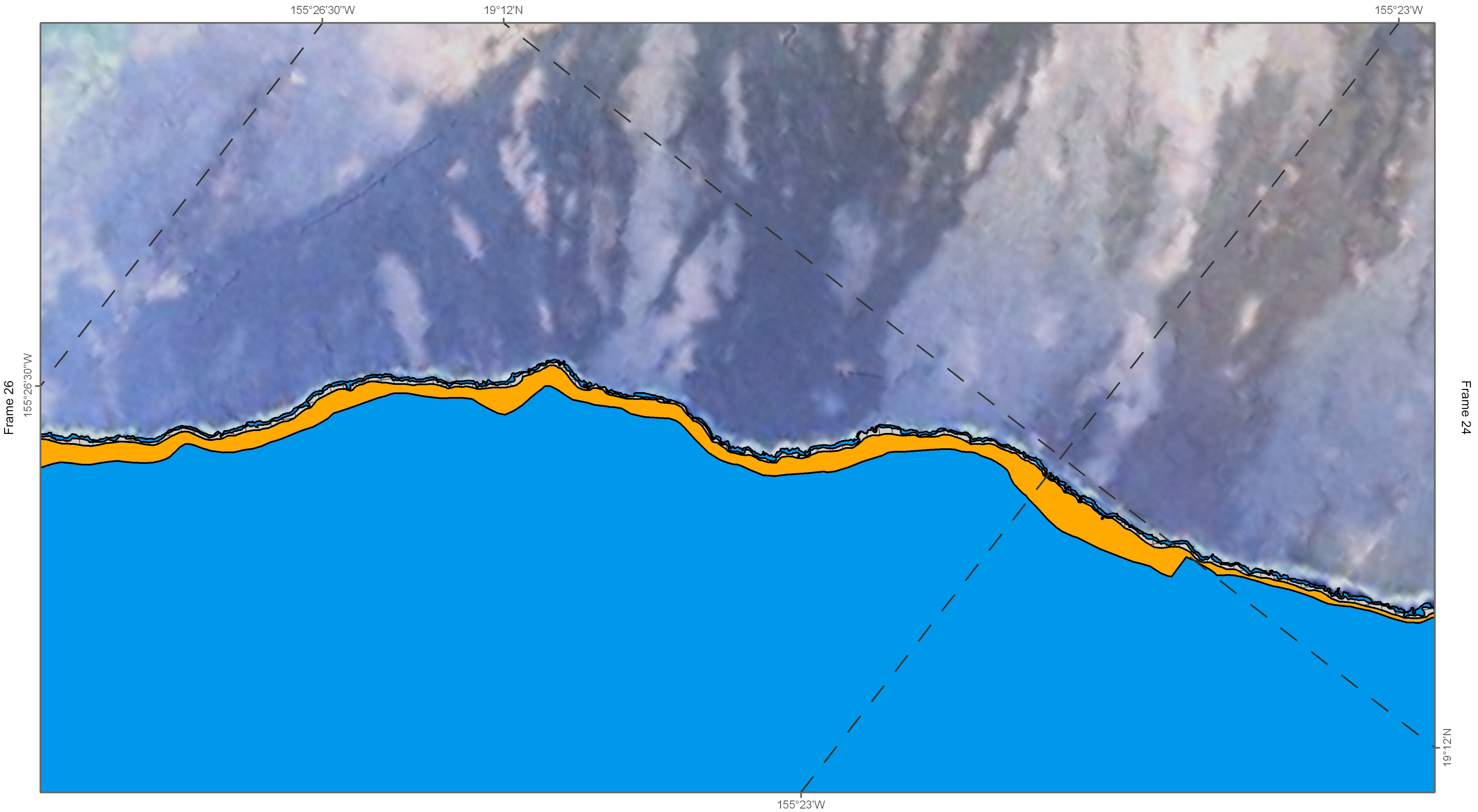
Geomorphological Structure Types

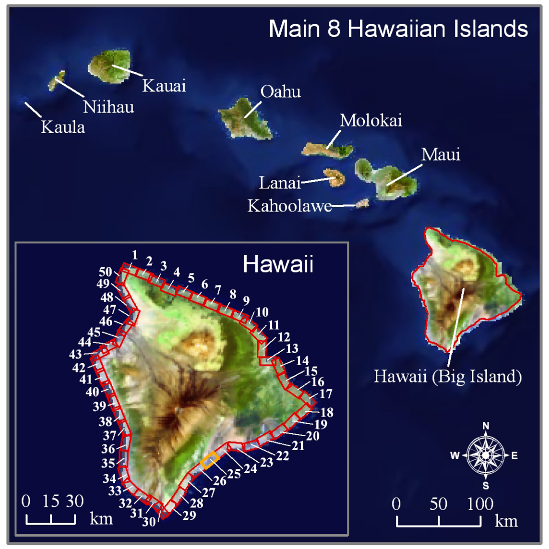
- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- 🟪 Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 25)


155°26'30"W
19°12'N
155°23'W
Frame 26
155°26'30"W
Frame 24
19°12'N
155°23'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30
km
Hawaii (Big Island)
N
W E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

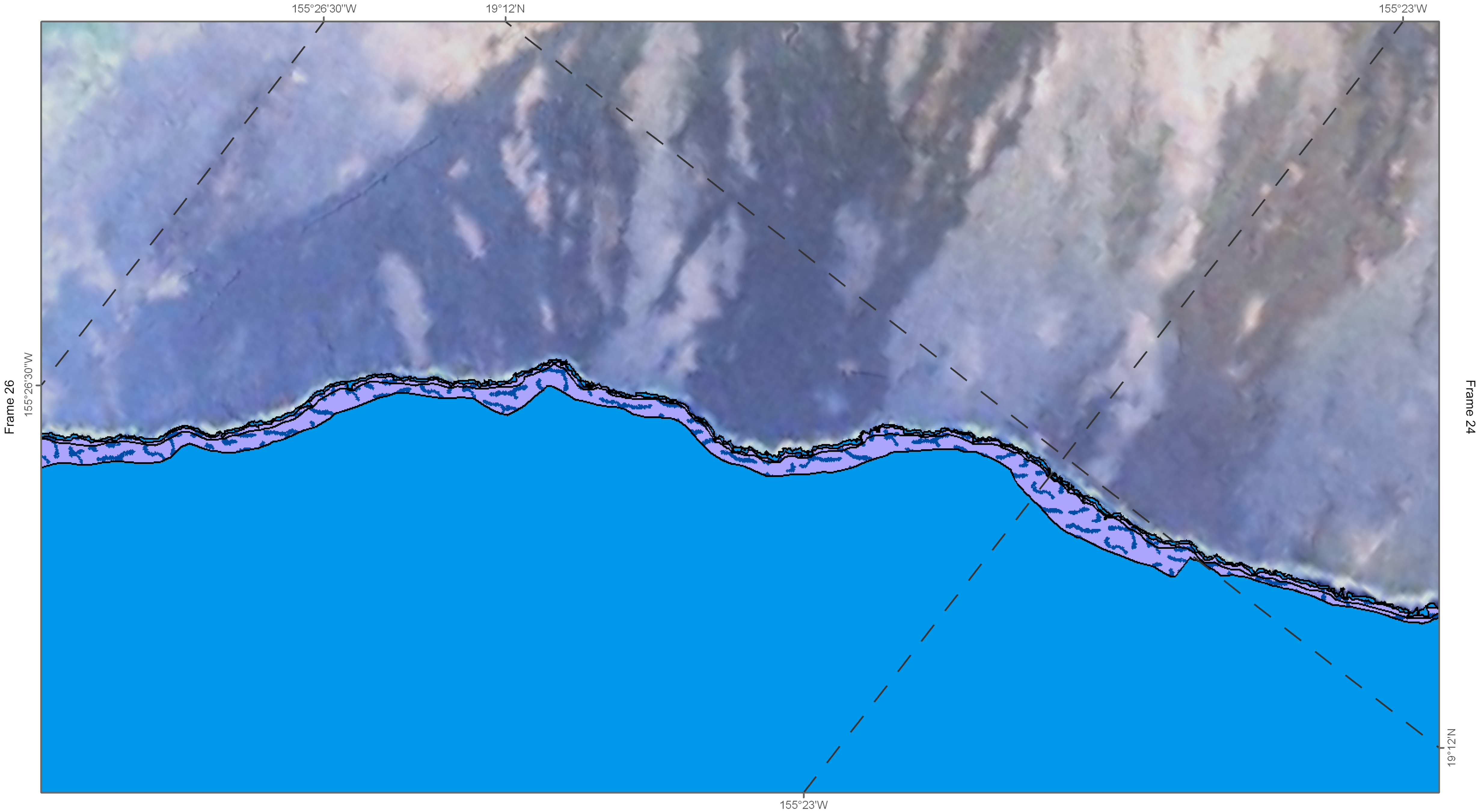
☐ Minimum Mapping Unit (1 Acre)

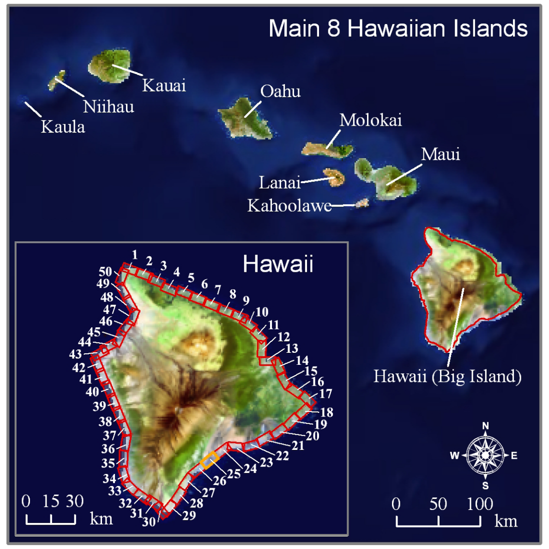
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 25)


155°26'30"W
19°12'N
155°23'W
Frame 26
155°26'30"W
Frame 24
19°12'N
155°23'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- 🟦 Unknown

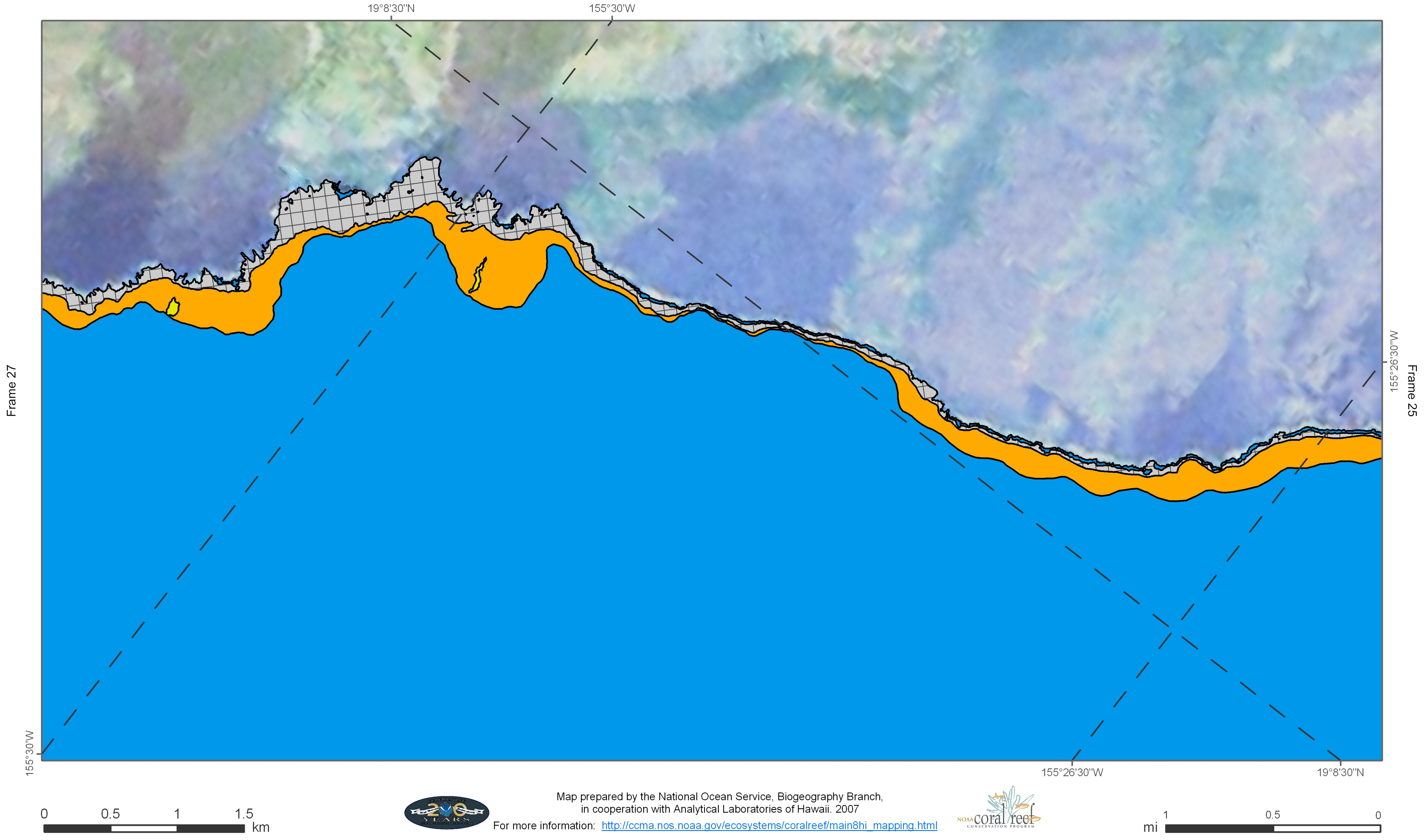
□ Minimum Mapping Unit (1 Acre)

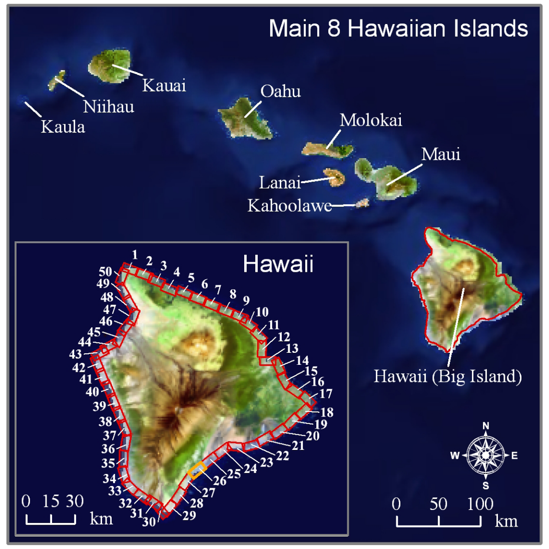
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 26)


19°8'30"N
155°30'W
Frame 27
155°30'W
Frame 25
155°26'30"W
155°26'30"W
19°8'30"N
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N
W
E
S

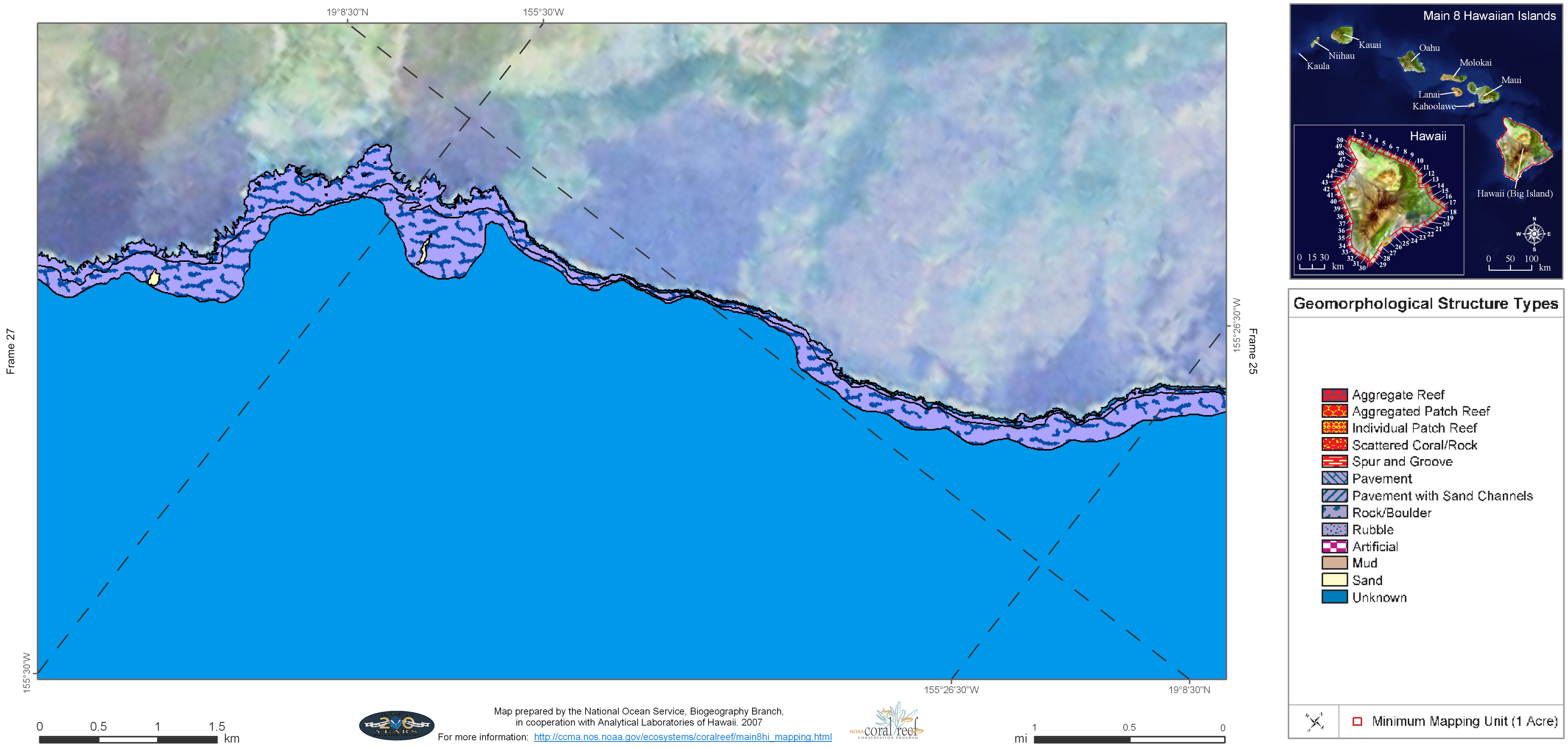
Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ◻ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ◻ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ◻ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

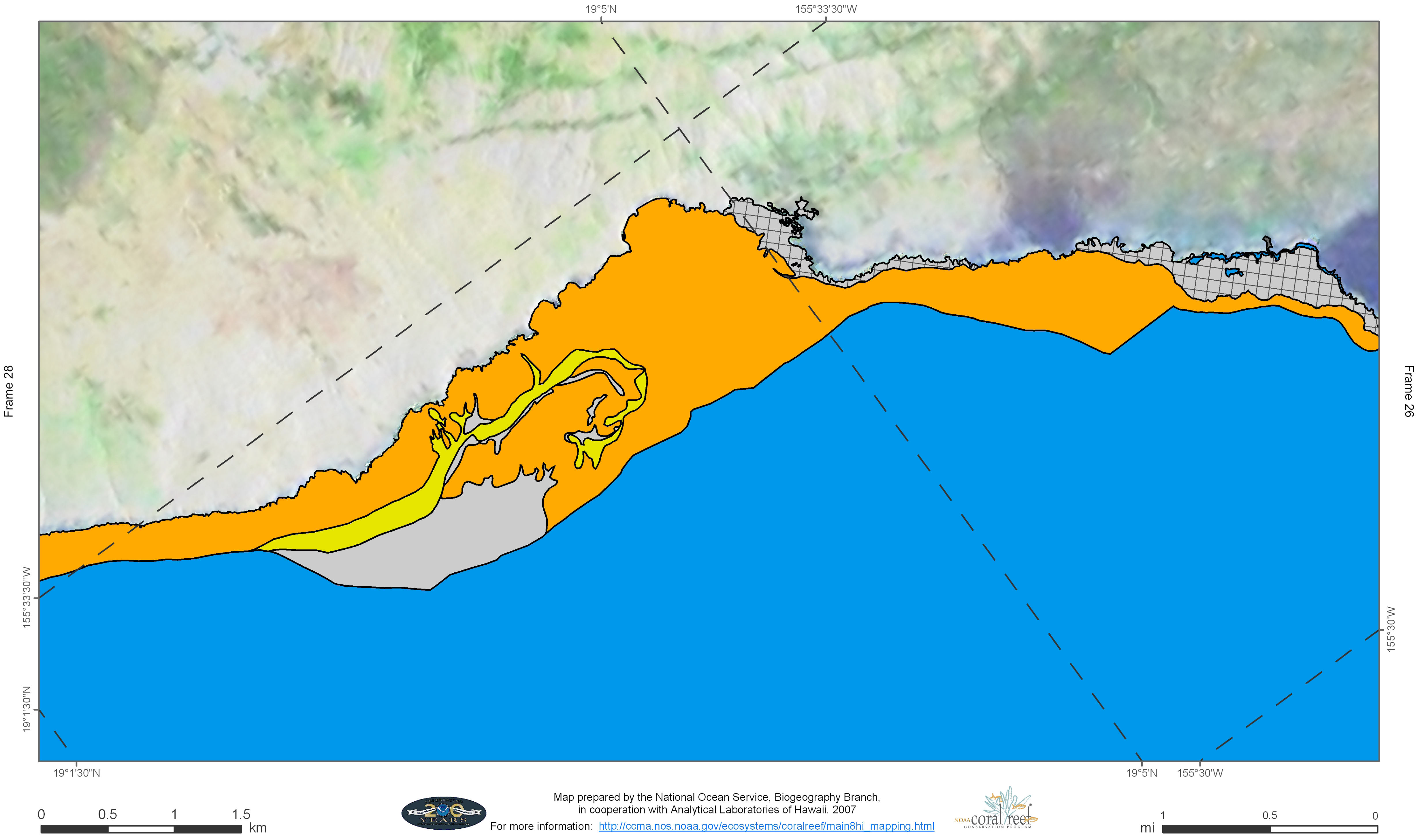
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

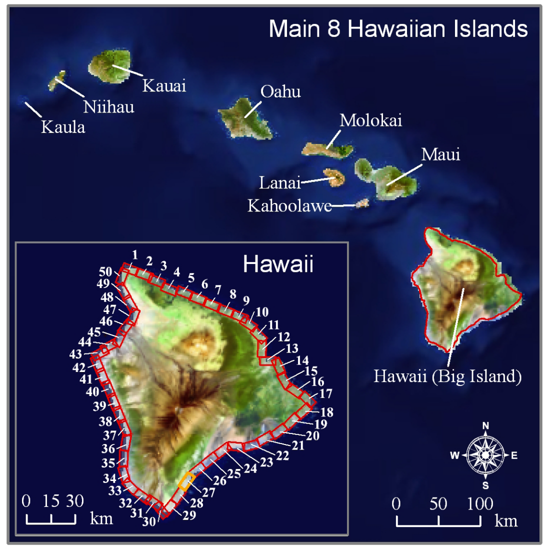
Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 26)


19°8'30"N
155°30'W
Frame 27
155°30'W
Frame 25
155°26'30"W
155°26'30"W
19°8'30"N
0
0.5
1
1.5
km
1
0.5
0
mi
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Hawaii
0 15 30 km
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 27)


19°5'N
155°33'30"W
Frame 28
155°33'30"W
19°1'30"N
Frame 26
155°30'W
19°1'30"N
19°5'N
155°30'W
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
W
E
S

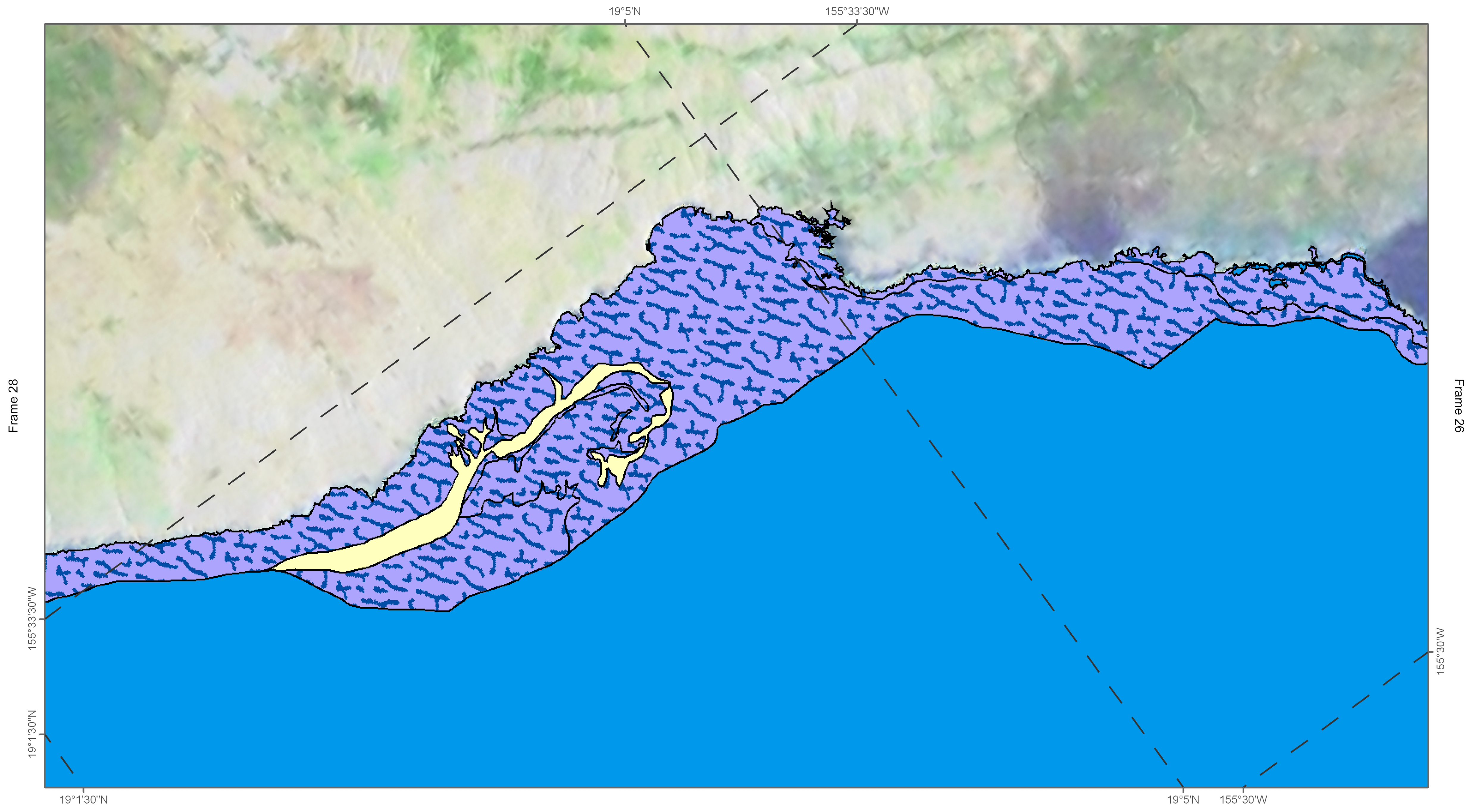
Biological Cover Types

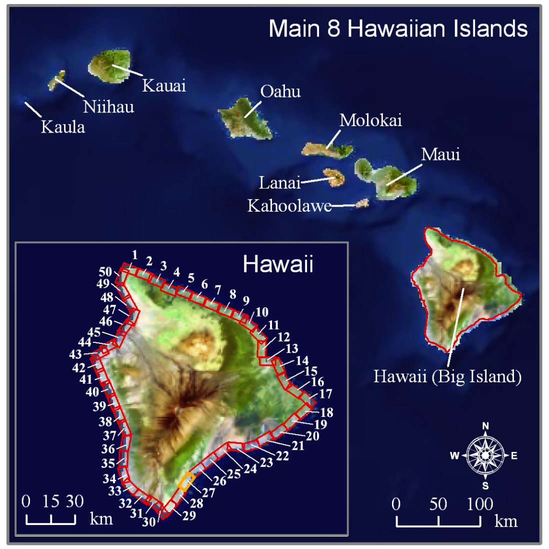
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ⬛ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

🟥 Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 27)


19°5'N
155°33'30"W
Frame 28
Frame 26
155°33'30"W
19°1'30"N
155°30'W
19°1'30"N
19°5'N
155°30'W
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
S
E
W

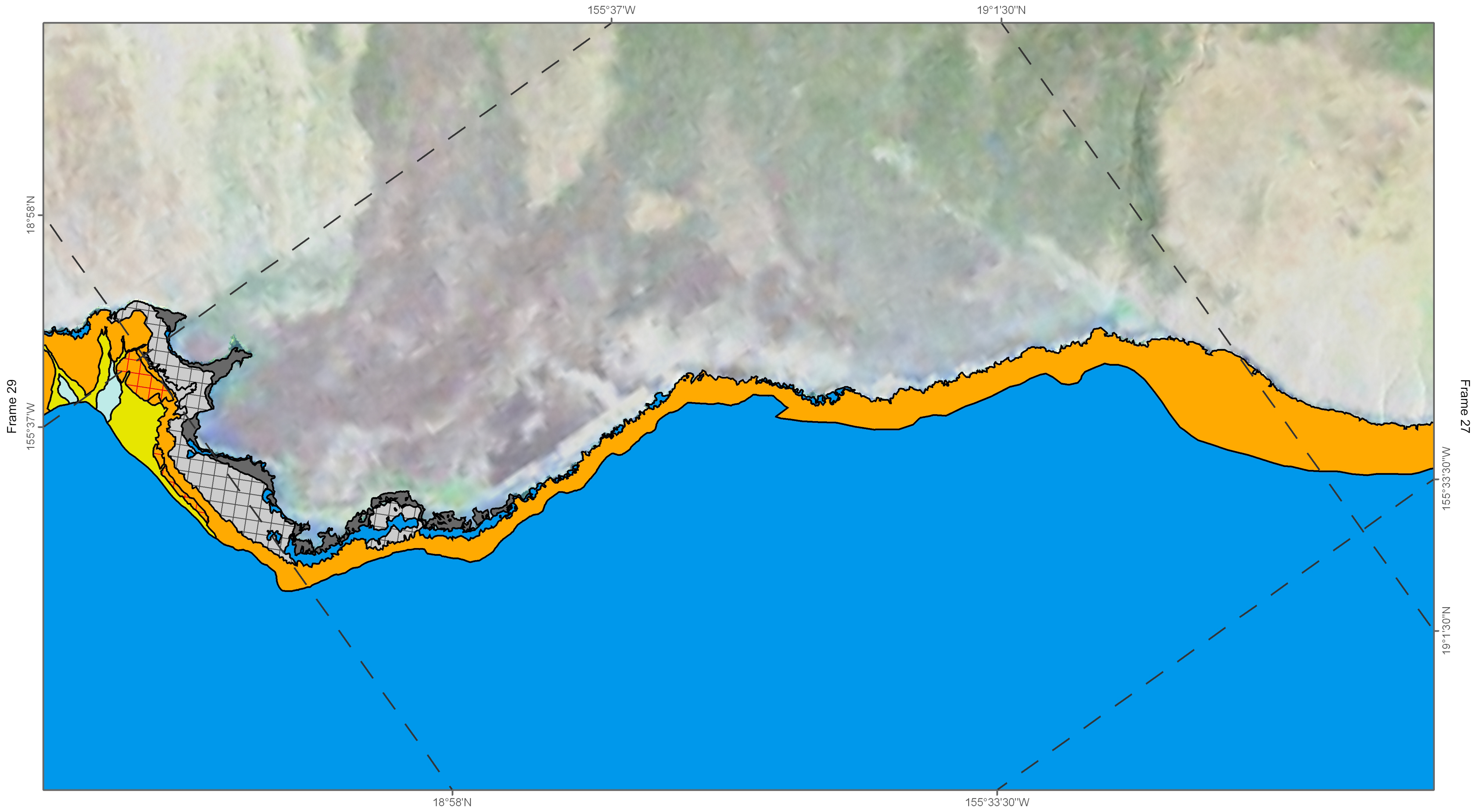
Geomorphological Structure Types

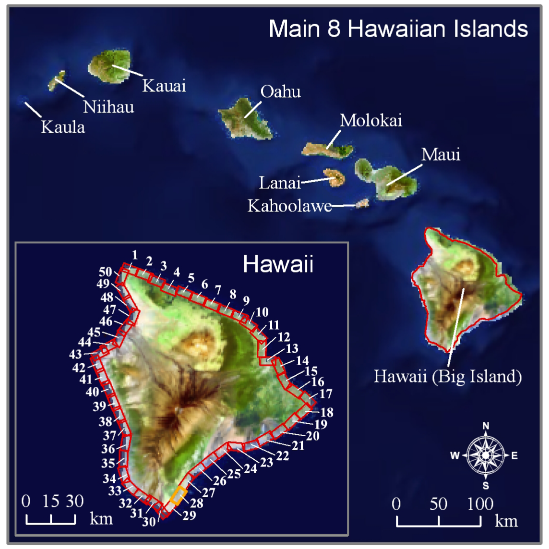
- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ■ Mud
- □ Sand
- ■ Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 28)


155°37'W
19°1'30"N
18°58'N
155°37'W
Frame 29
Frame 27
155°33'30"W
19°1'30"N
18°58'N
155°33'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

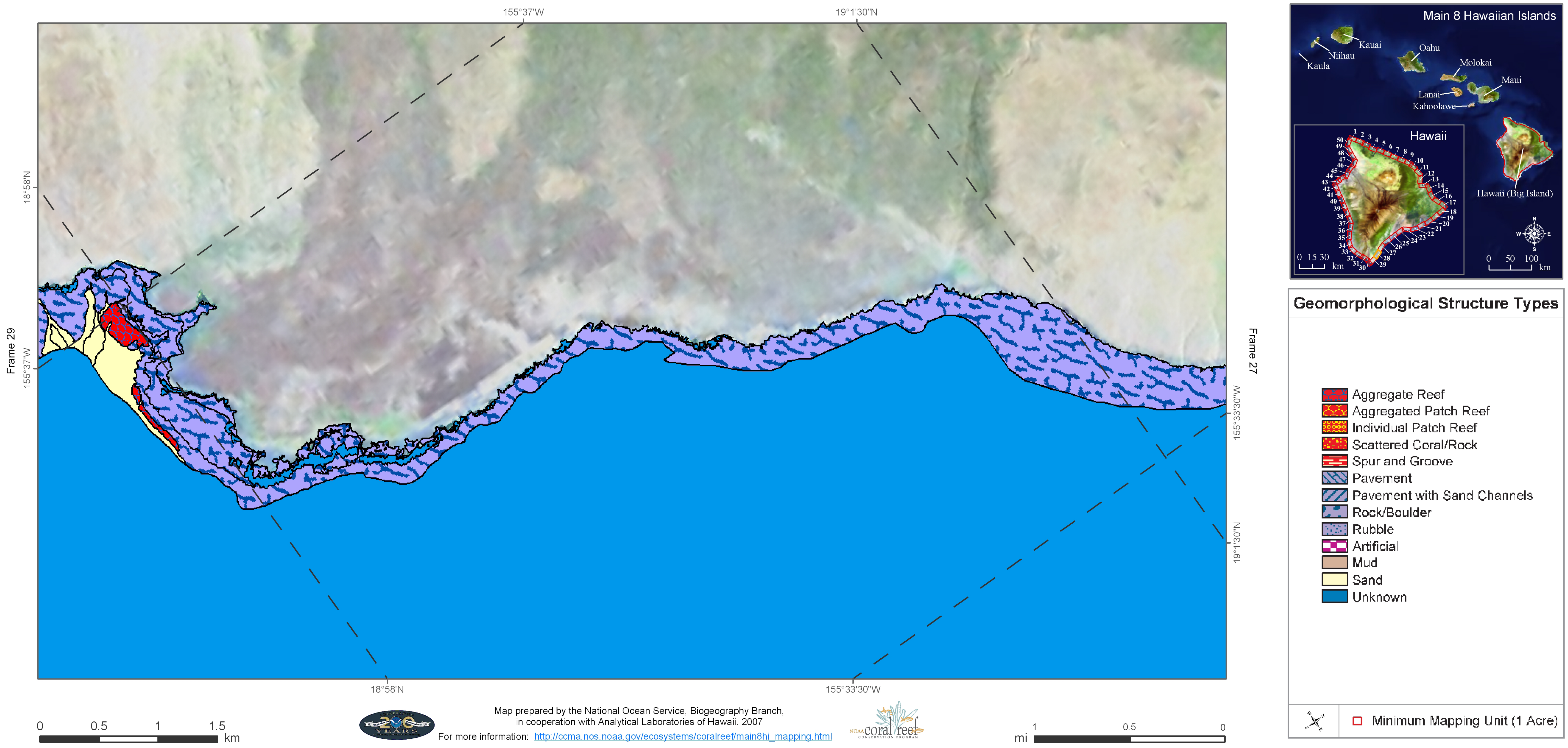
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

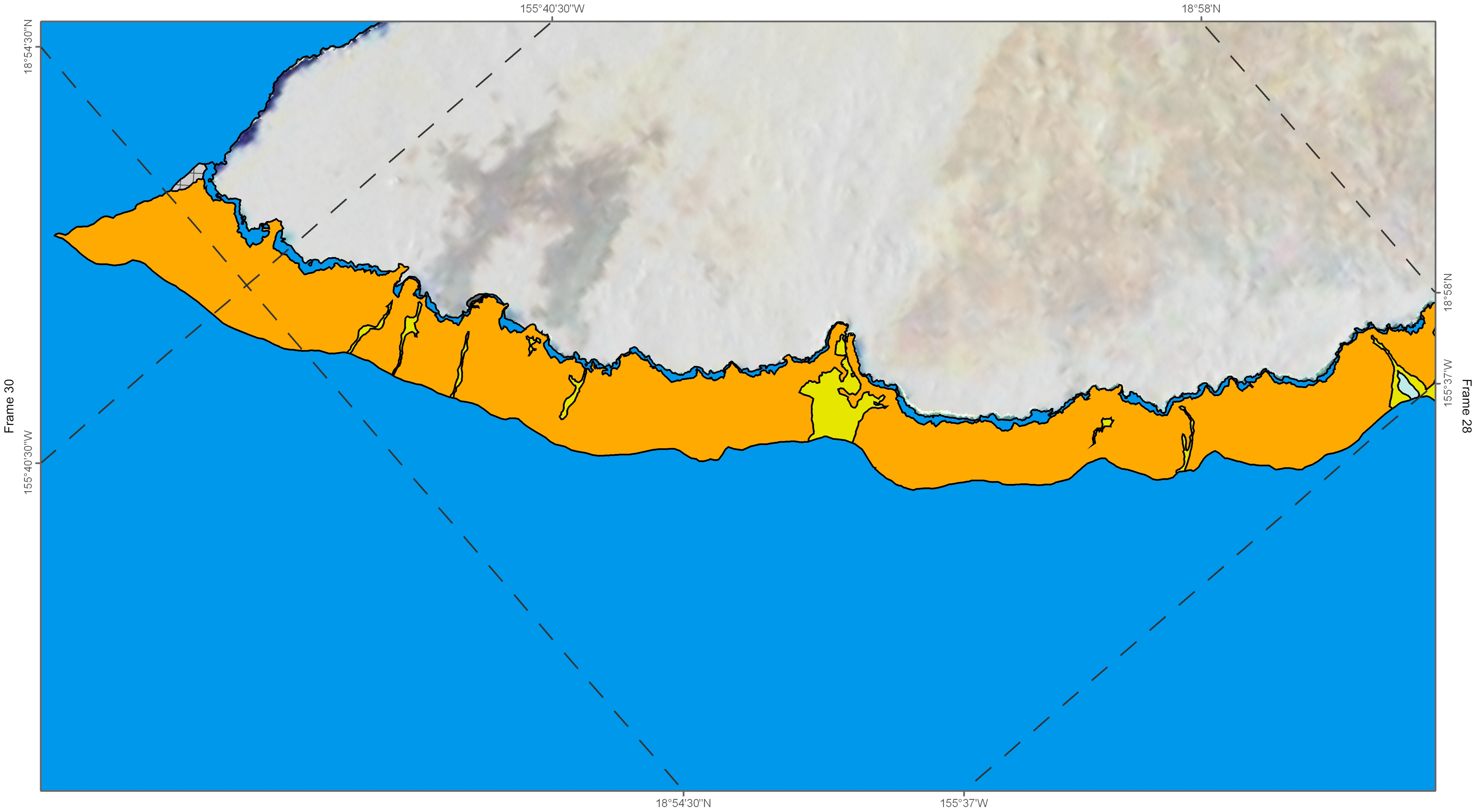
mi 1 0.5 0

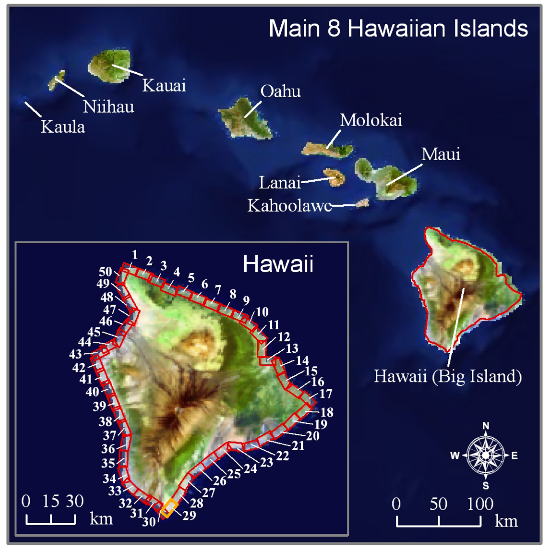
Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 28)


155°37'W
19°1'30"N
18°58'N
155°37'W
Frame 29
Frame 27
155°33'30"W
19°1'30"N
18°58'N
155°33'30"W
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
E
S
W
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)
0 0.5 1 1.5 km
1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 29)


155°40'30"W
18°58'N
18°54'30"N
155°40'30"W
18°58'N
155°37'W
18°54'30"N
155°37'W
Frame 30
Frame 28
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km

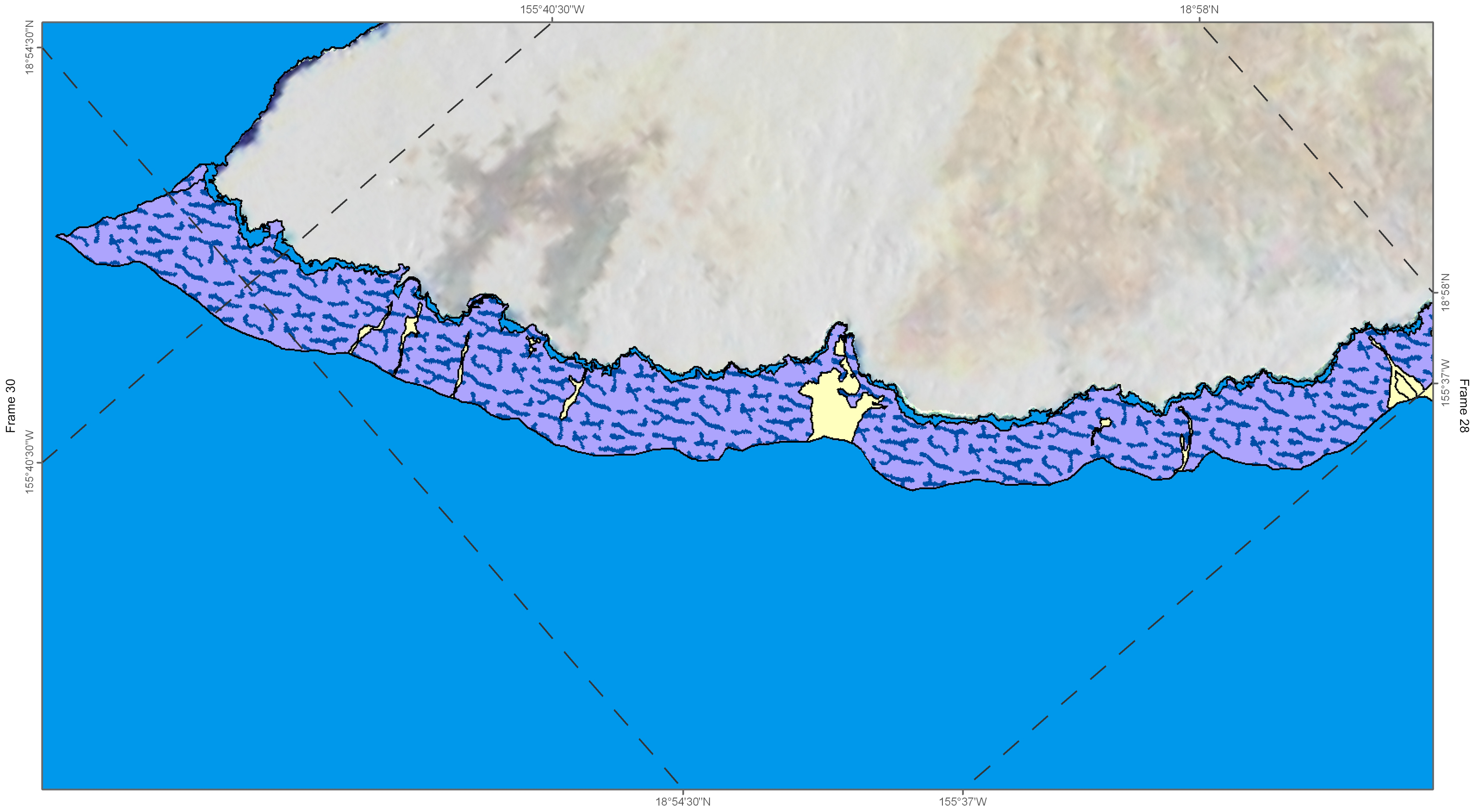
Biological Cover Types

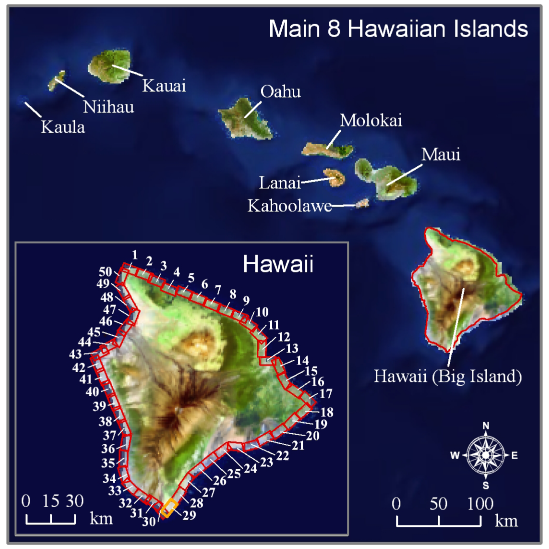
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟨 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 29)


155°40'30"W
18°58'N
18°54'30"N
155°40'30"W
Frame 30
18°58'N
155°37'W
Frame 28
18°54'30"N
155°37'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

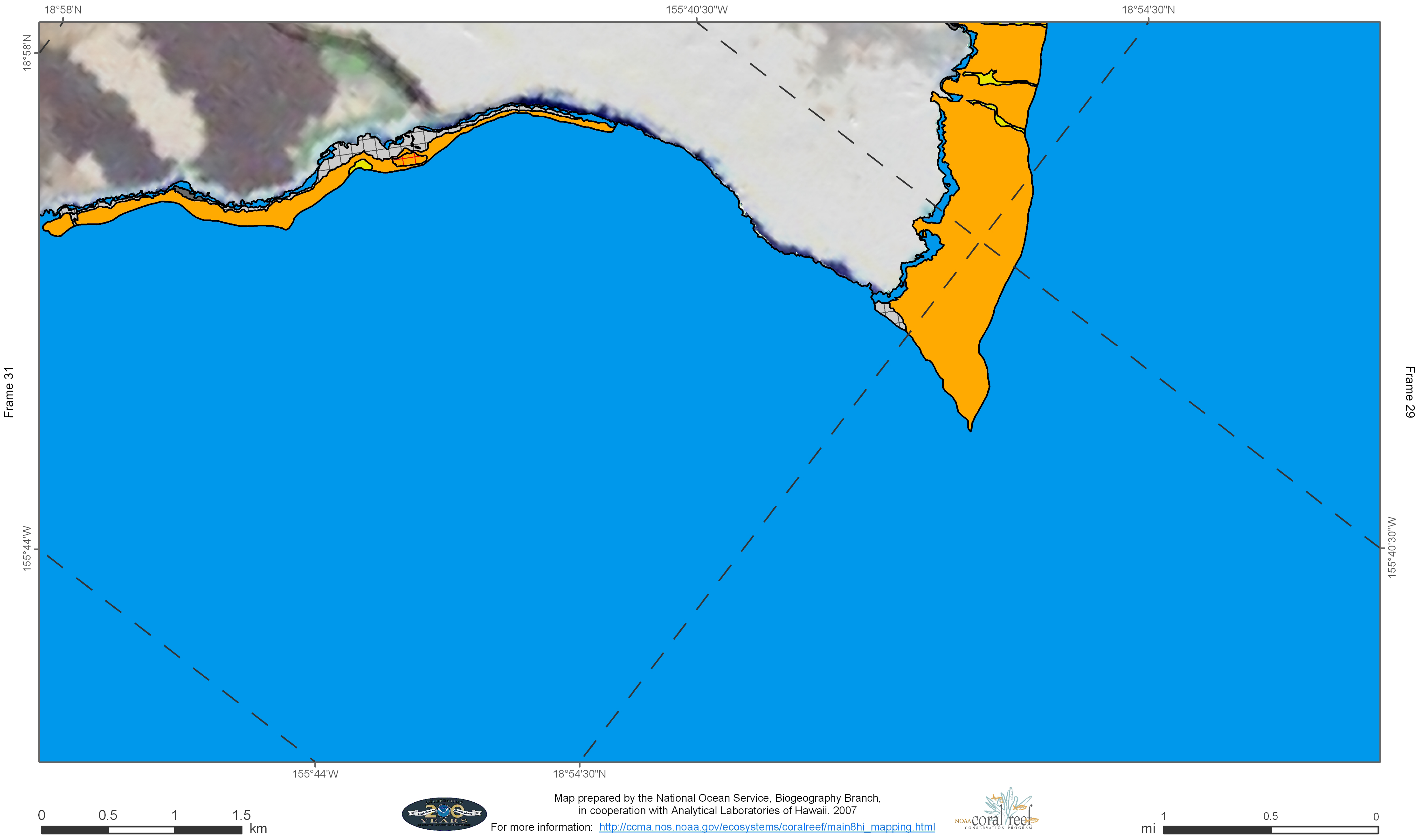
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

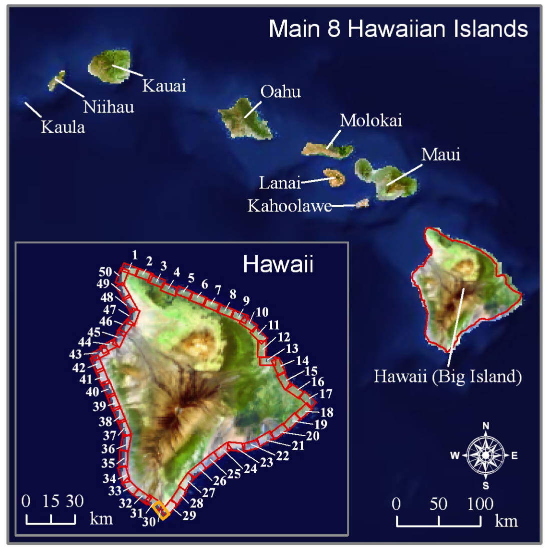
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 30)


18°58'N
155°40'30"W
18°54'30"N
18°58'N
Frame 31
155°44'W
Frame 29
155°40'30"W
155°44'W
18°54'30"N
0
0.5
1
1.5
km
1
0.5
0
mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

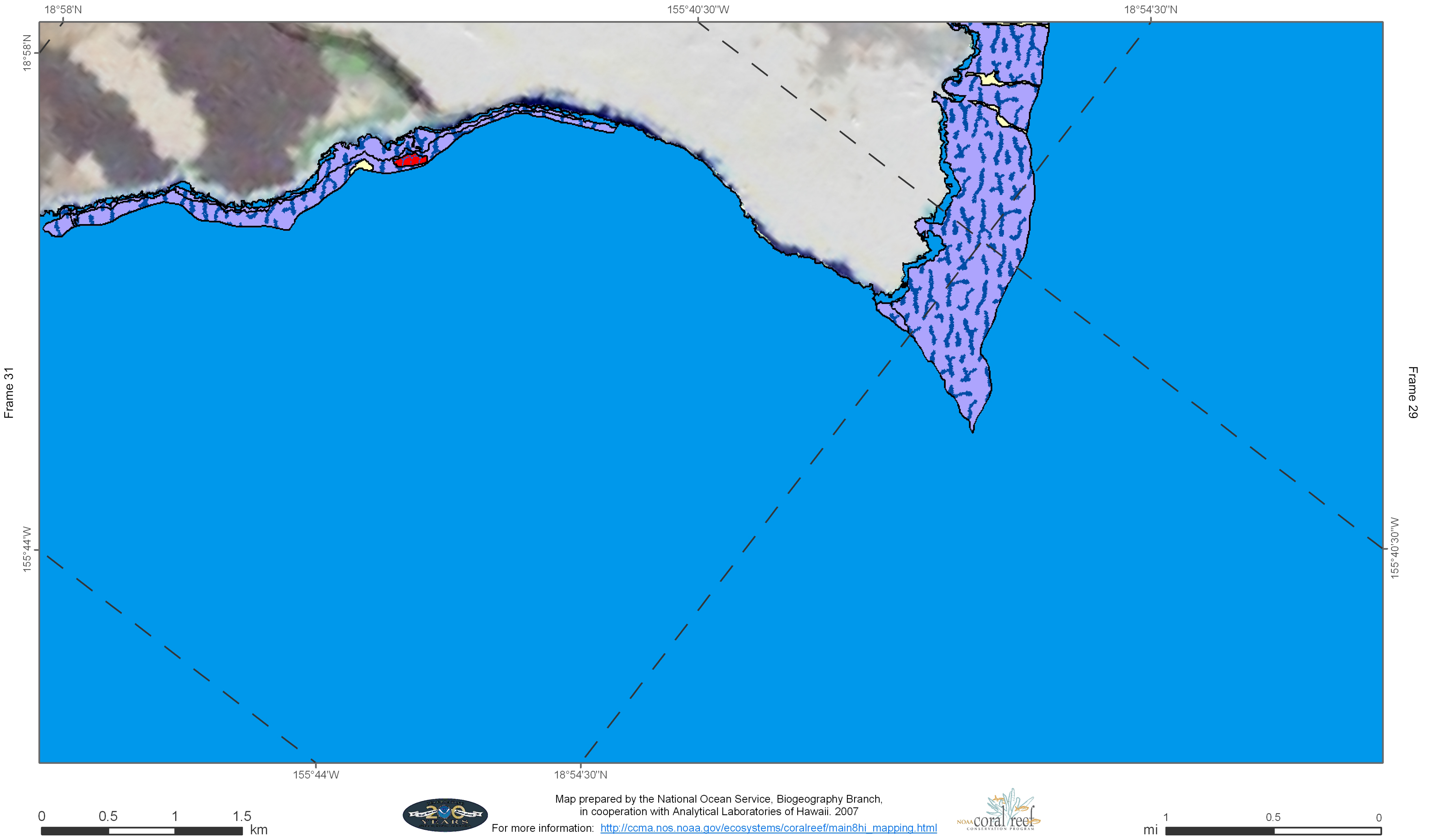

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

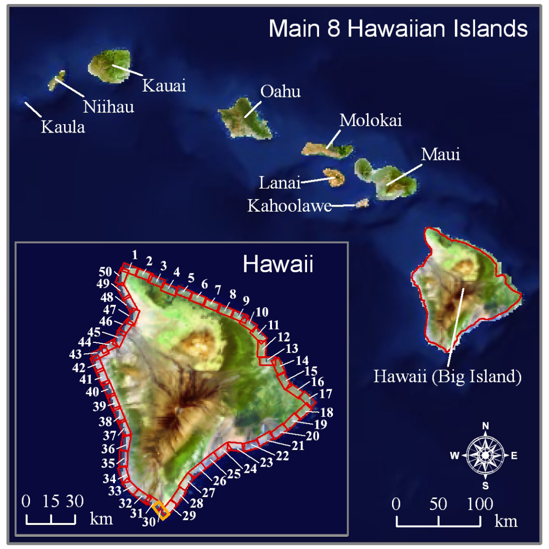
Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

🟥 Minimum Mapping Unit (1 Acre)

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 30)


18°58'N
155°40'30"W
18°54'30"N
18°58'N
Frame 31
155°44'W
Frame 29
155°40'30"W
155°44'W
18°54'30"N
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
E
S
W

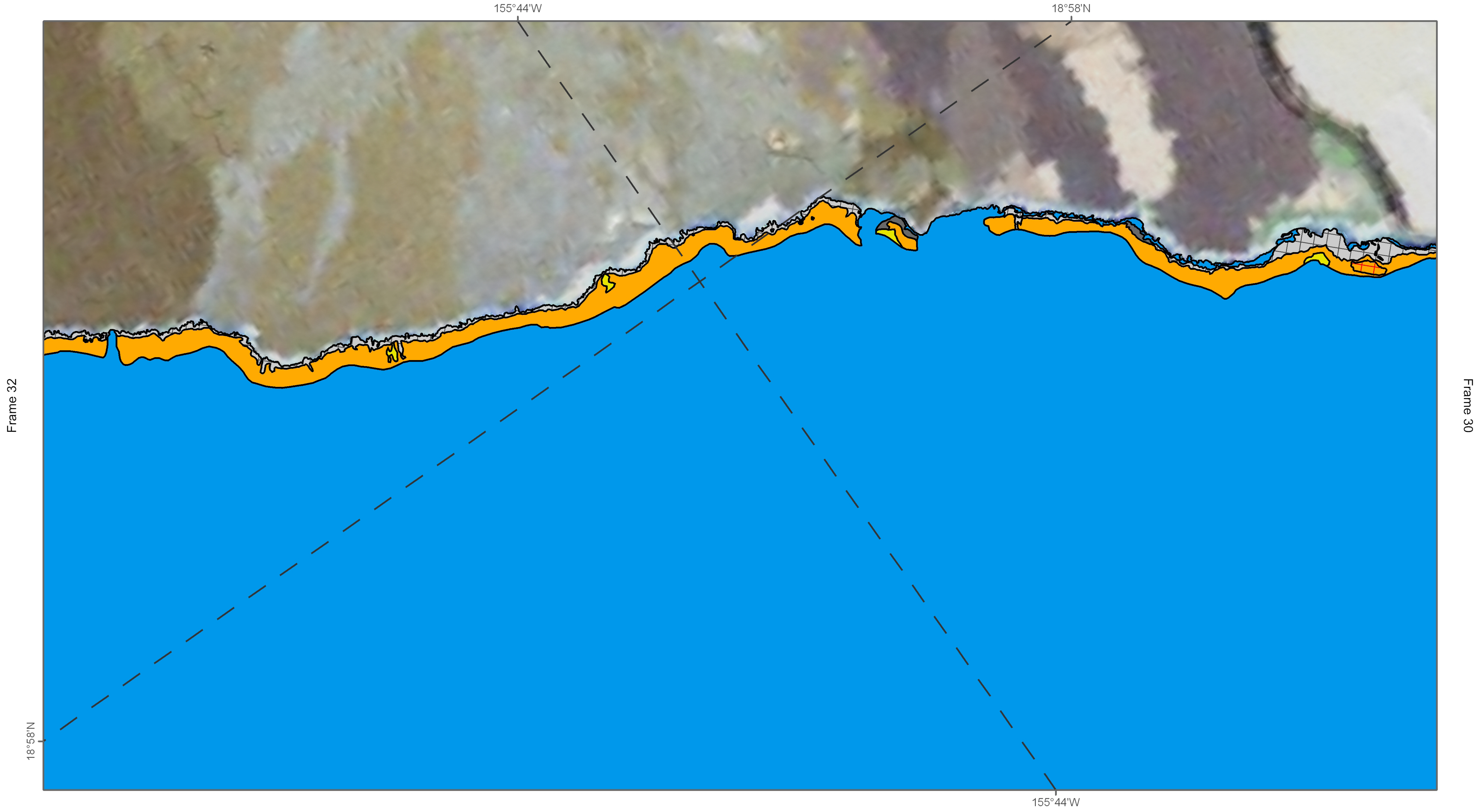
Geomorphological Structure Types

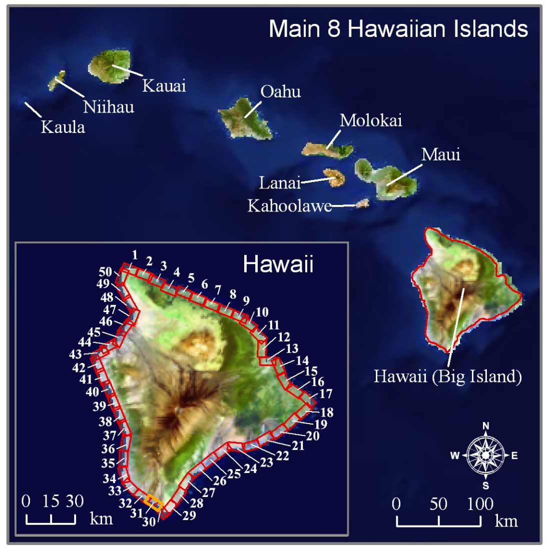
- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 31)


155°44'W
18°58'N
Frame 32
Frame 30
18°58'N
155°44'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N
E
S
W

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ☐ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ☐ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ☐ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

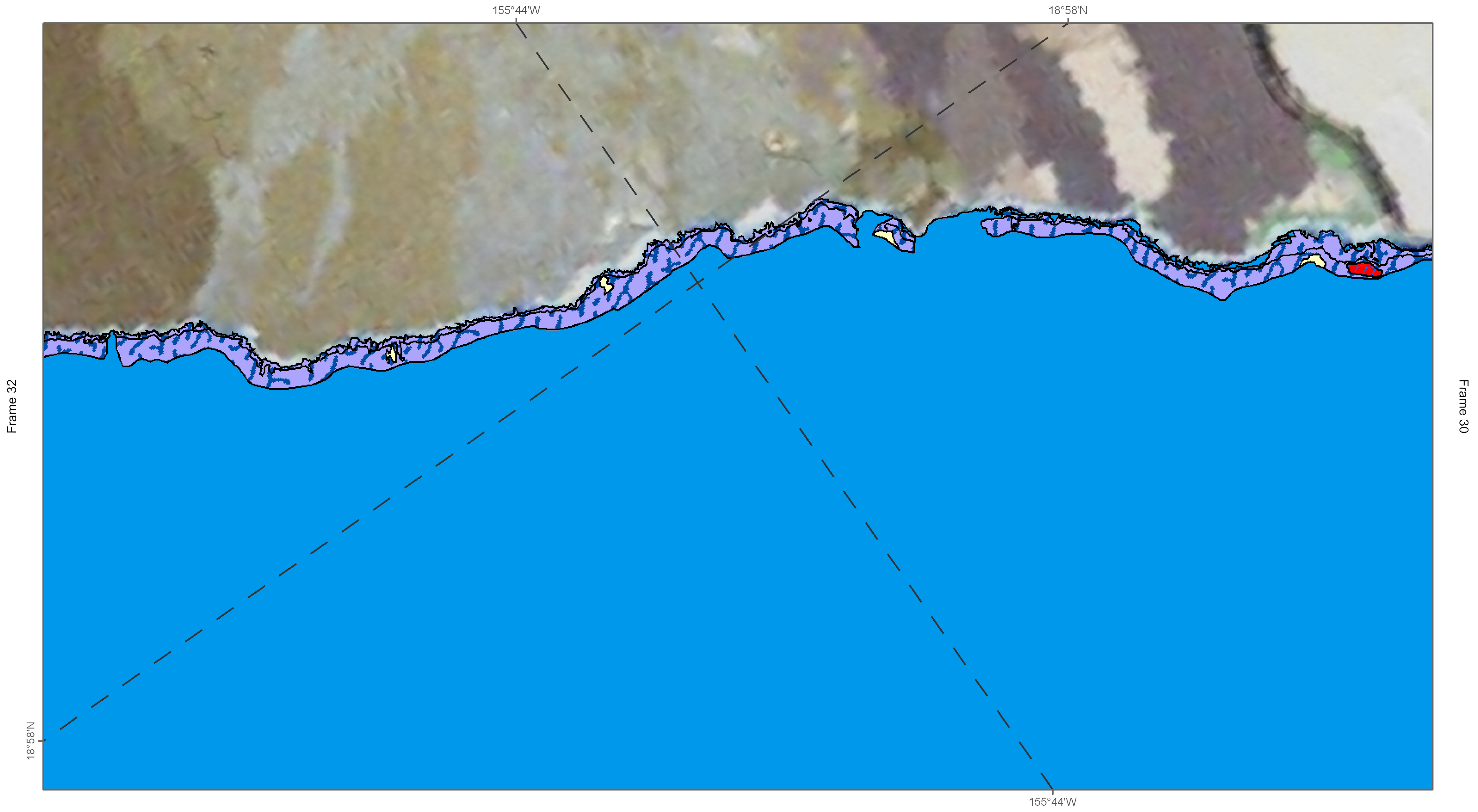
🟥 Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

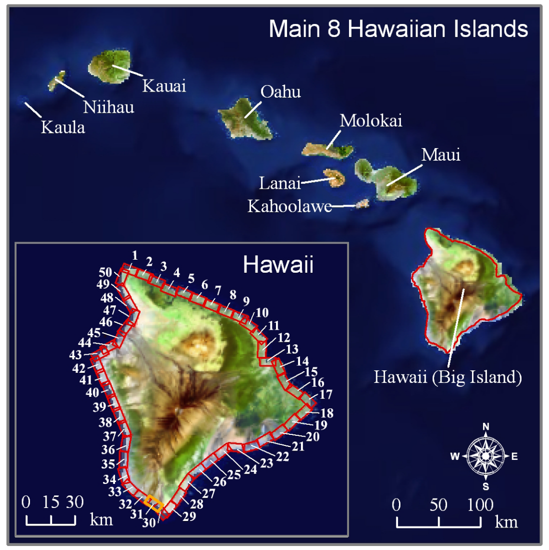
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 31)



155°44'W
18°58'N
Frame 32
Frame 30
18°58'N
155°44'W



Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

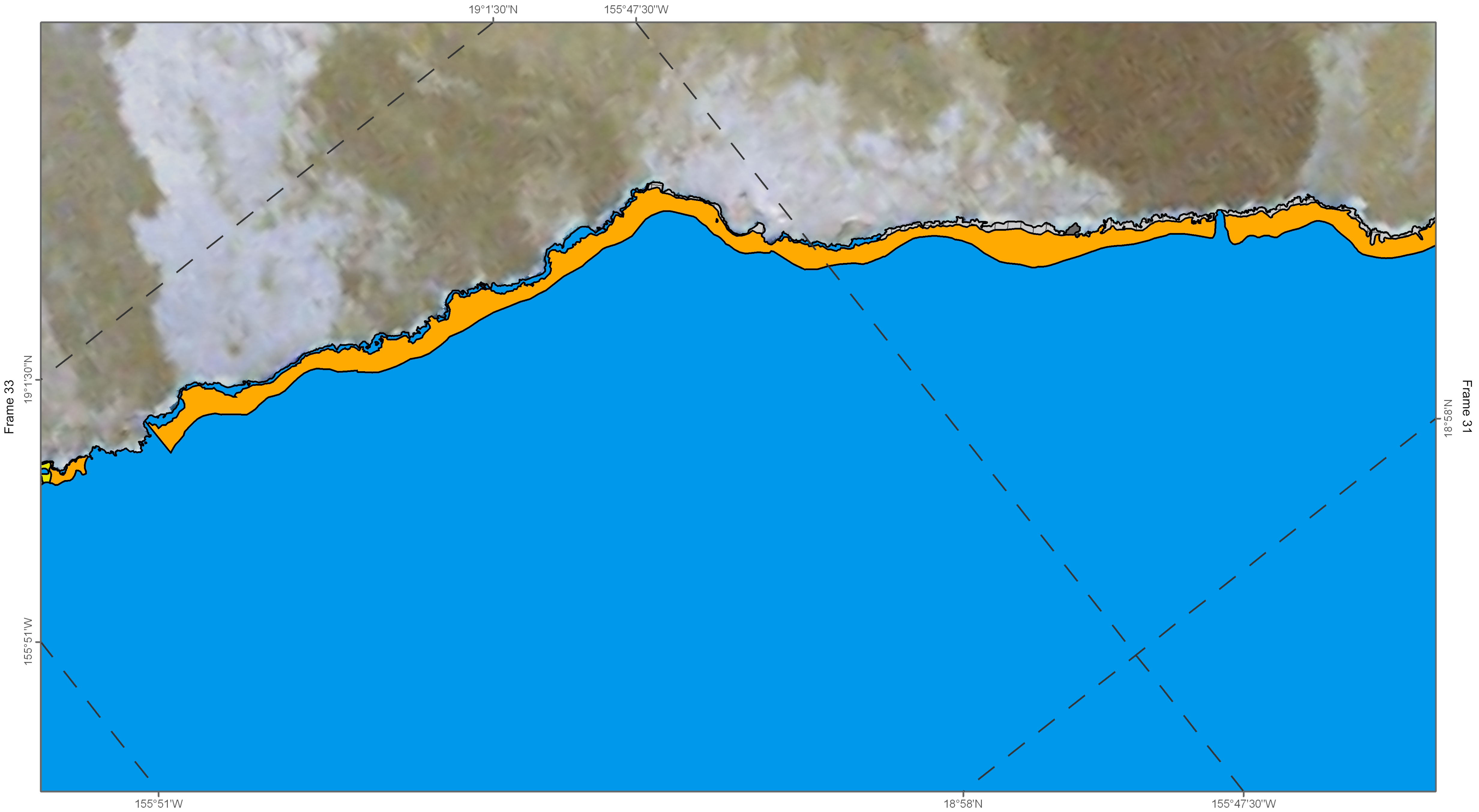
☐ Minimum Mapping Unit (1 Acre)

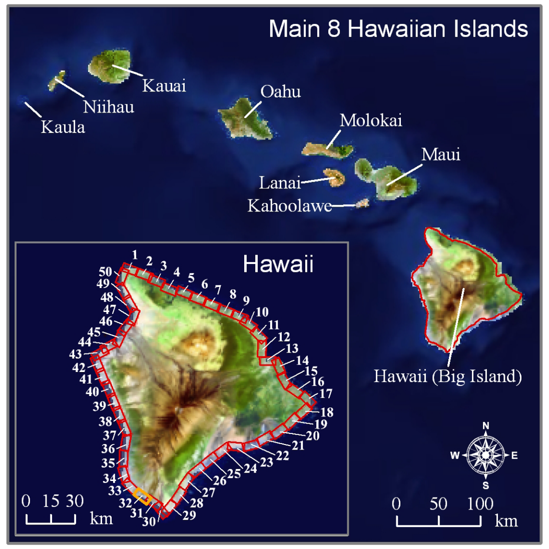
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 32)


19°1'30"N
155°47'30"W
Frame 33
19°1'30"N
155°51'W
Frame 31
18°58'N
155°51'W
18°58'N
155°47'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
Hawaii (Big Island)
N
E
S
W
0 50 100 km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

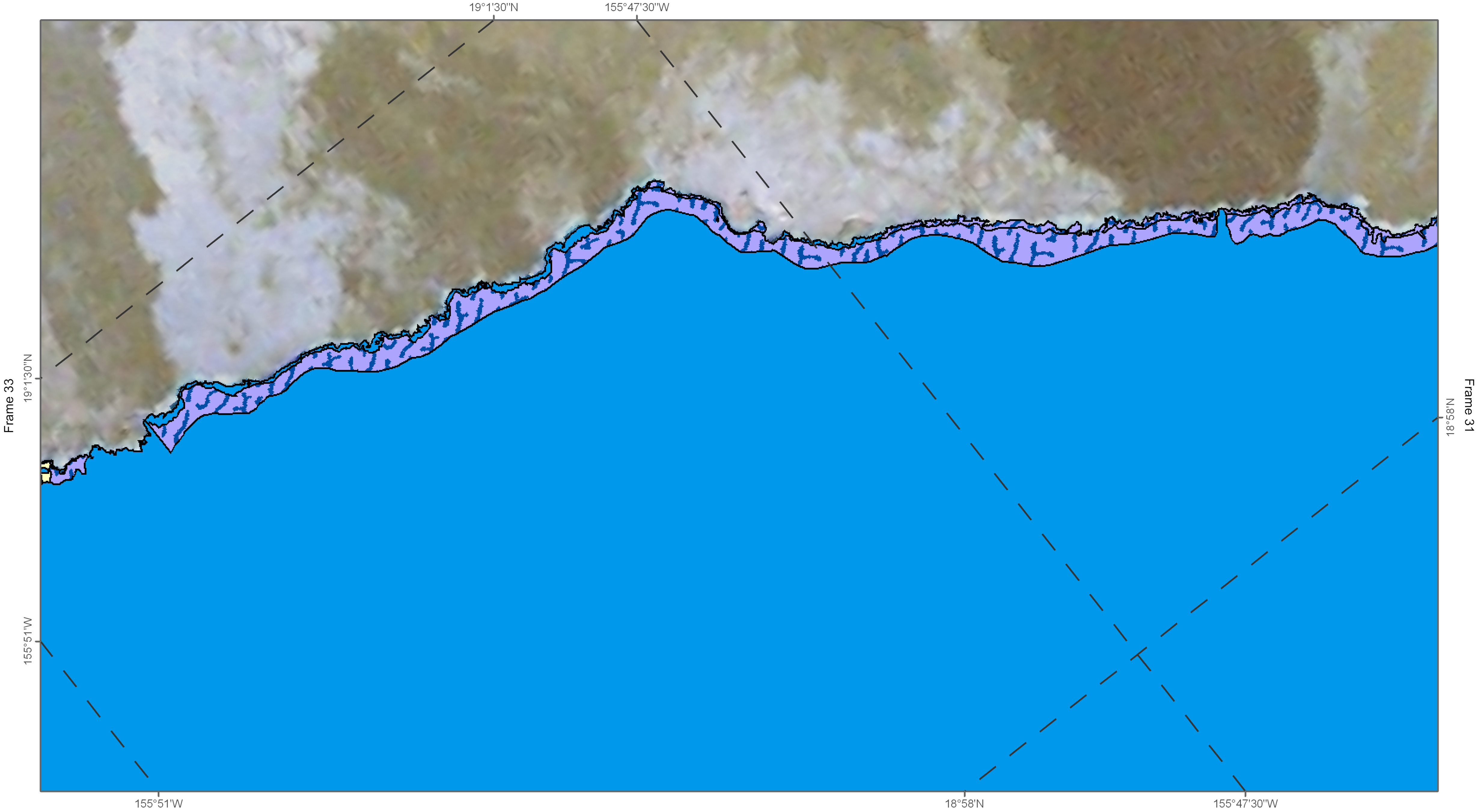
☐ Minimum Mapping Unit (1 Acre)

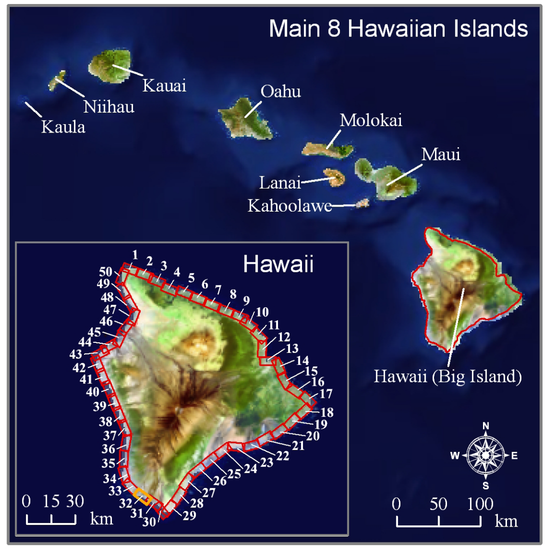
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

0 0.5 1 1.5 km

1 0.5 0 mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 32)


19°1'30"N
155°47'30"W
Frame 33
19°1'30"N
155°51'W
Frame 31
18°58'N
155°51'W
18°58'N
155°47'30"W
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
E
S
W

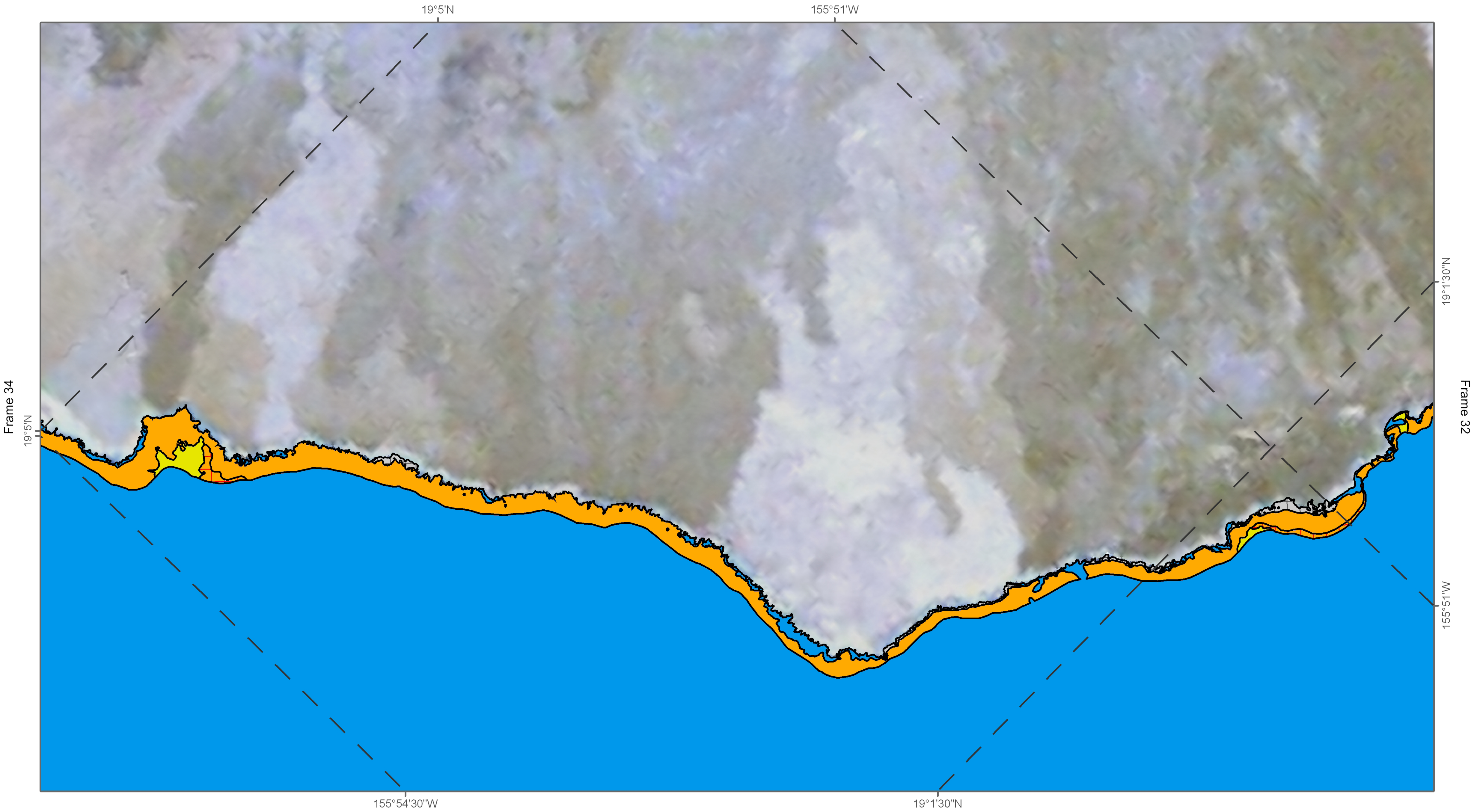
Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ■ Mud
- ■ Sand
- ■ Unknown

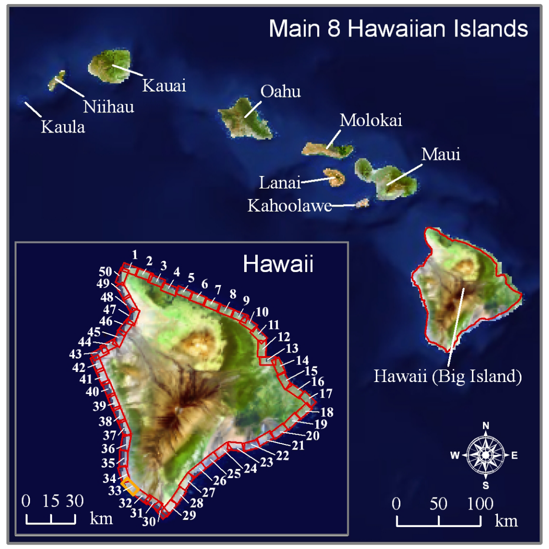
☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 33)



19°5'N
155°51'W
Frame 34
19°5'N
19°1'30"N
Frame 32
155°51'W
155°54'30"W
19°1'30"N



Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N E S W

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- 🟦 Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- 🟪 Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

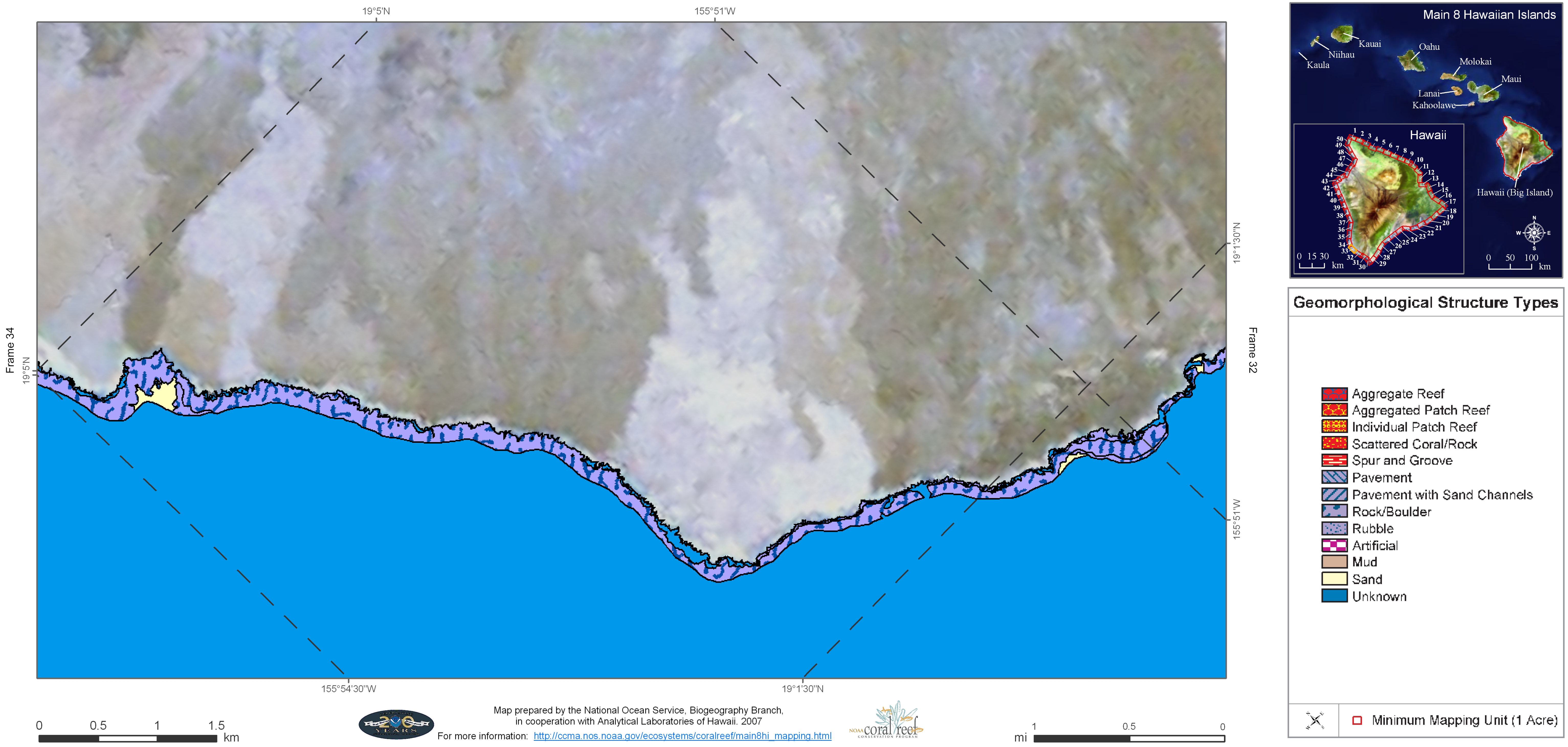
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

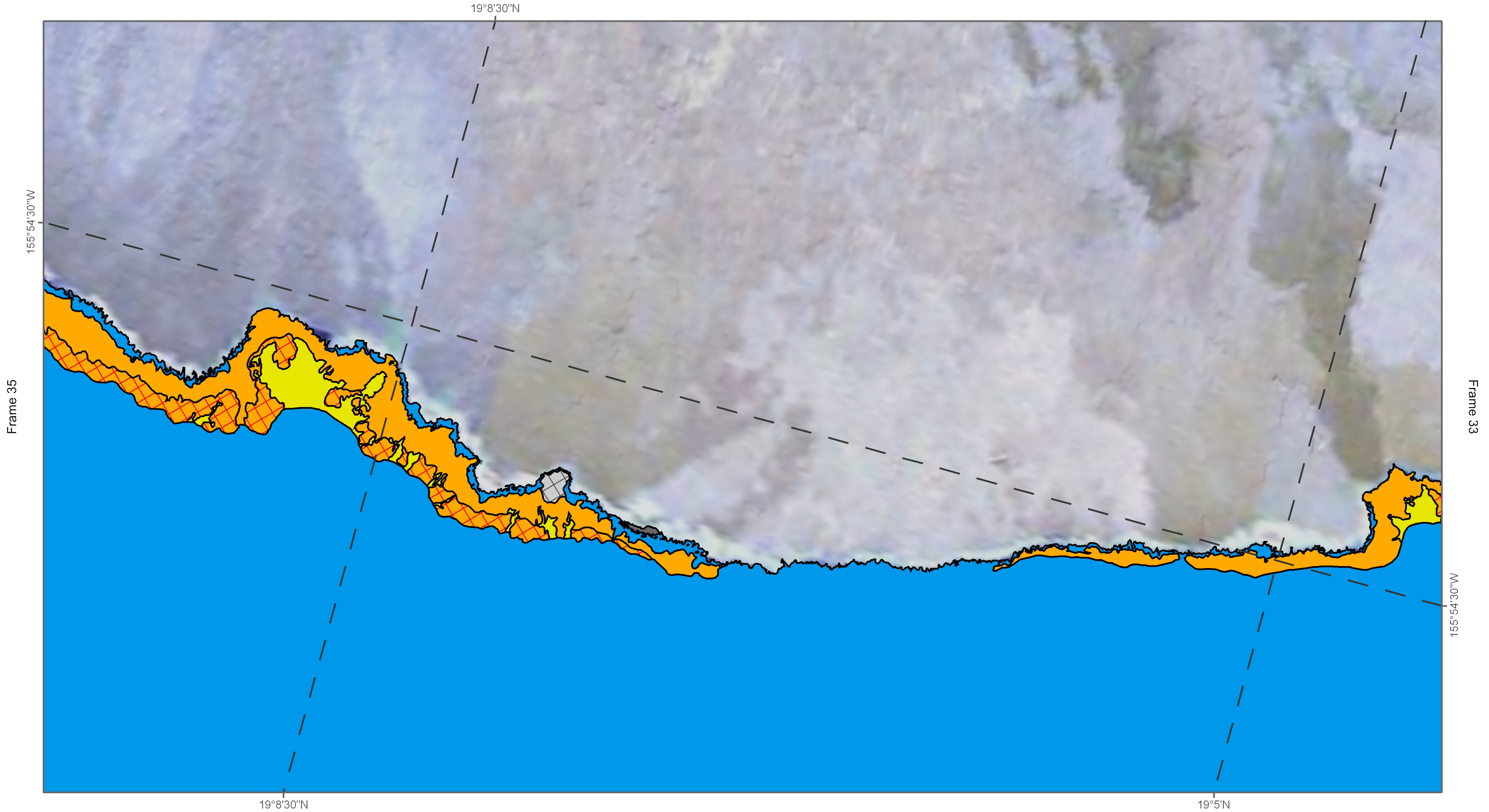
mi 1 0.5 0

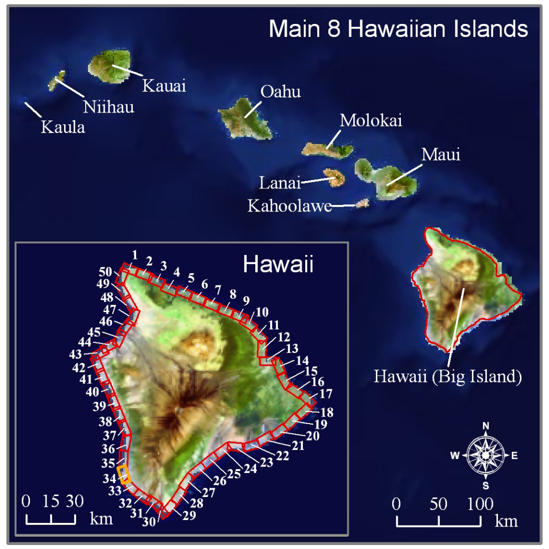
Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 33)


19°5'N
155°51'W
Frame 34
19°5'N
Frame 32
19°1'30"N
155°51'W
155°54'30"W
19°1'30"N
0 0.5 1 1.5 km
mi 1 0.5 0
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 34)


19°8'30"N
155°54'30"W
Frame 35
Frame 33
155°54'30"W
19°8'30"N
19°5'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
E
S
W

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

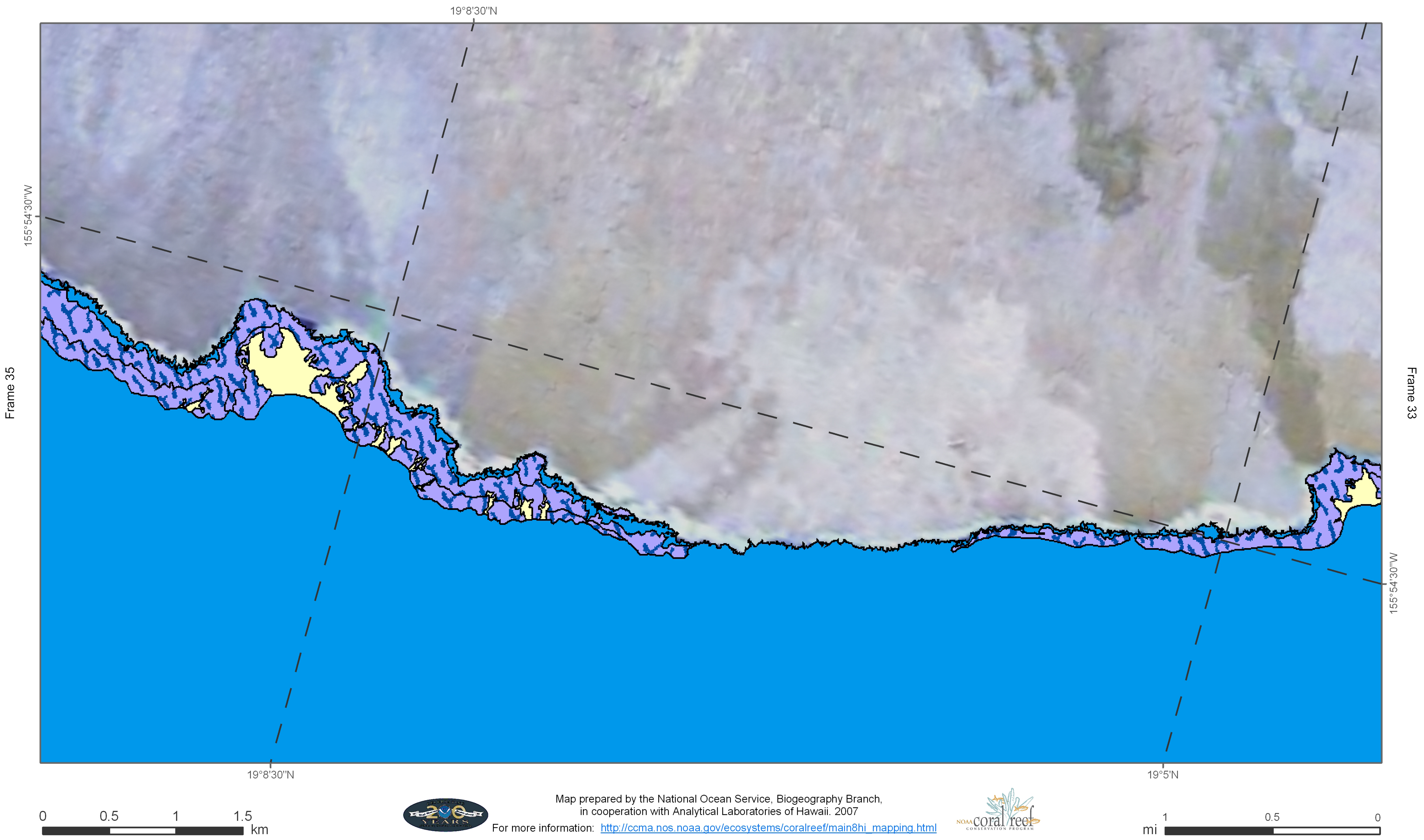
☐ Minimum Mapping Unit (1 Acre)

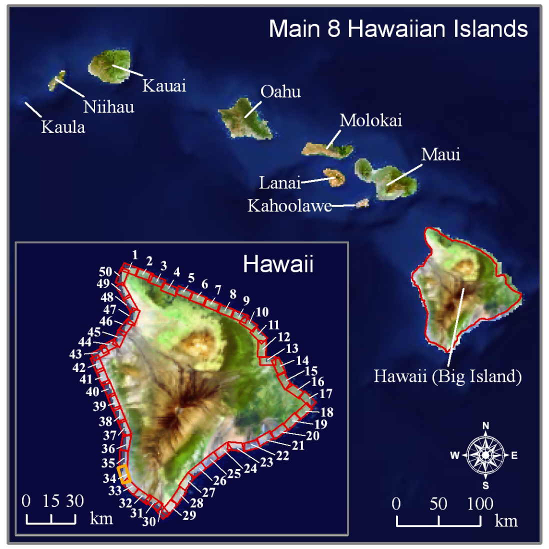
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 34)


19°8'30"N
155°54'30"W
Frame 35
Frame 33
155°54'30"W
19°8'30"N
19°5'N
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30
km
Hawaii (Big Island)
N
E
S
W
0 50 100
km

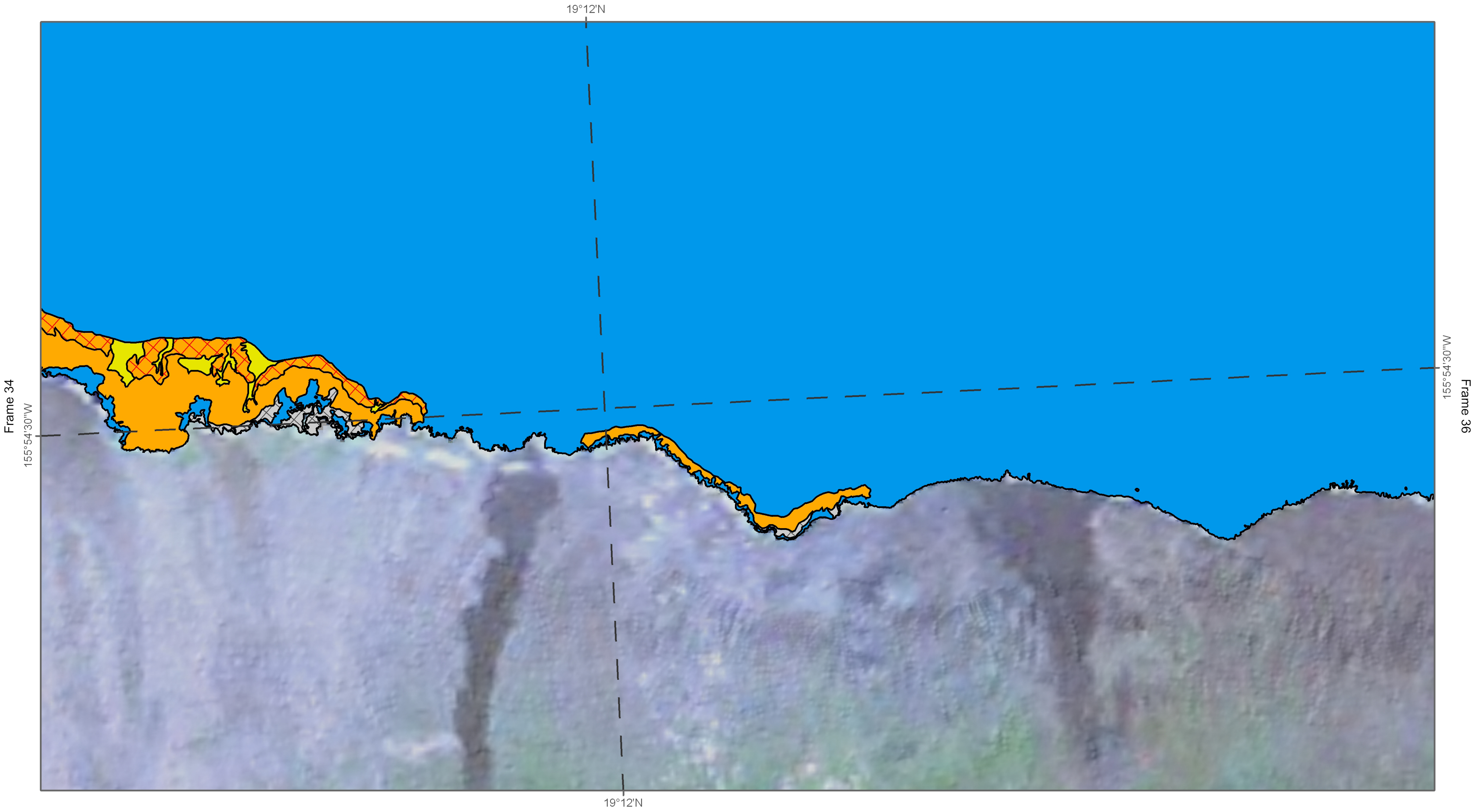
Geomorphological Structure Types

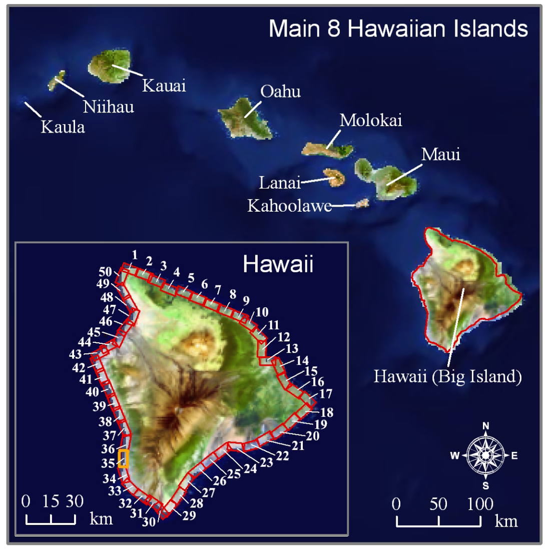
- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 35)


19°12'N
Frame 34
155°54'30"W
155°54'30"W
Frame 36
19°12'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

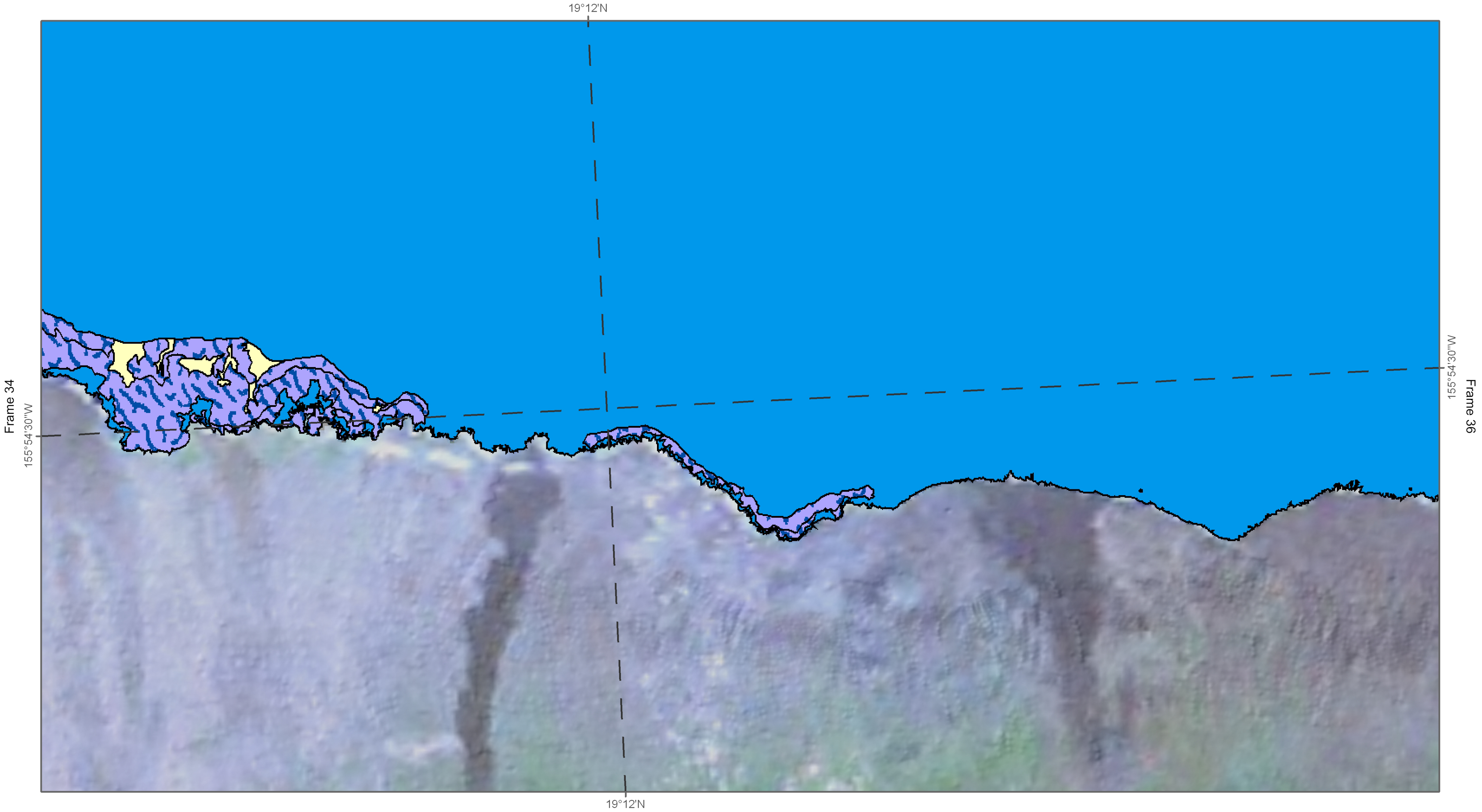
☐ Minimum Mapping Unit (1 Acre)

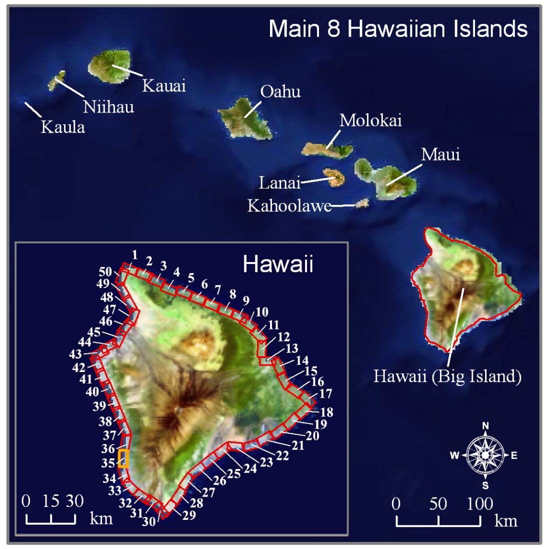
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 35)


19°12'N
19°12'N
155°54'30"W
155°54'30"W
Frame 34
Frame 36
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N
W
E
S

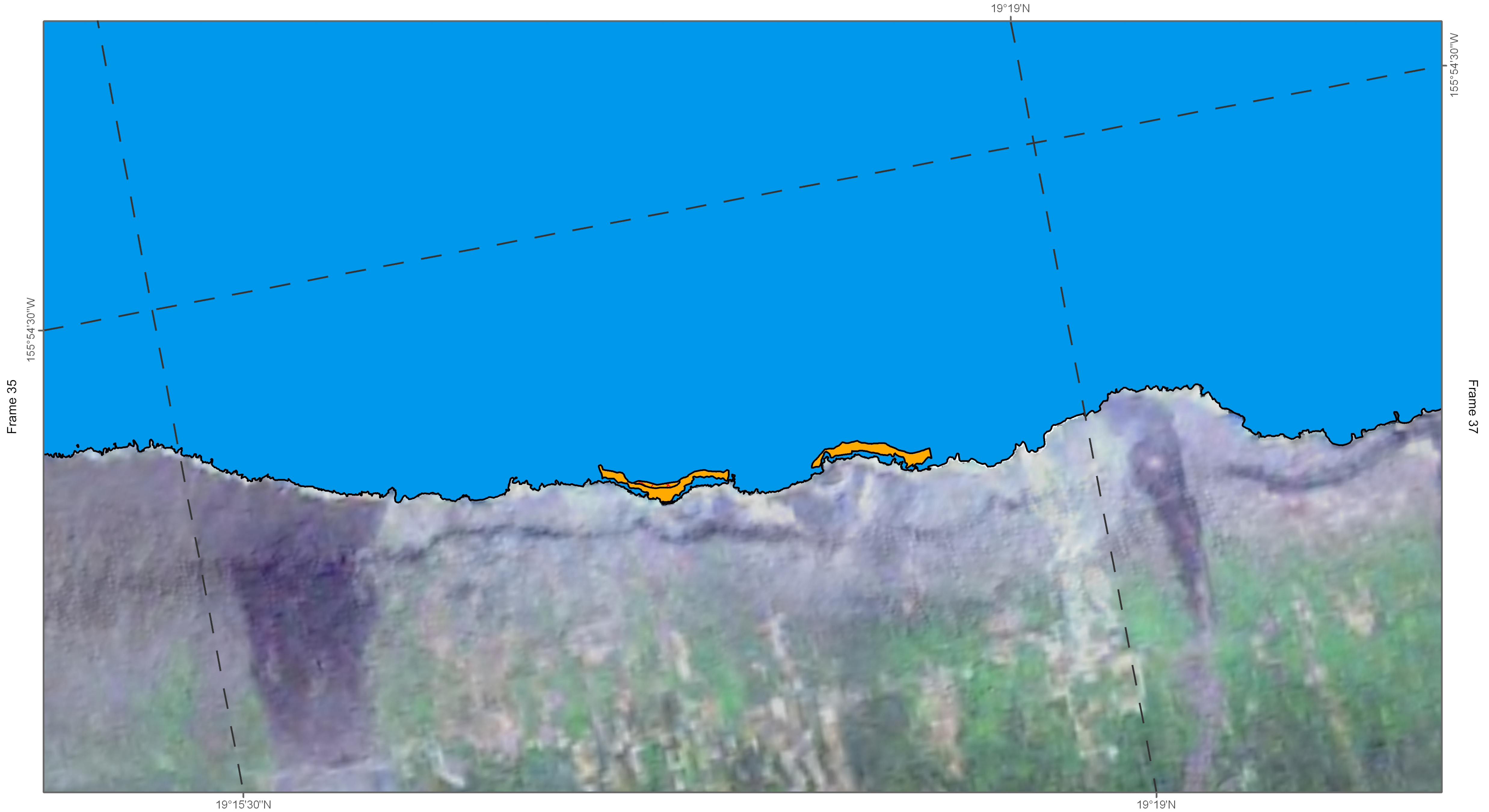
Geomorphological Structure Types

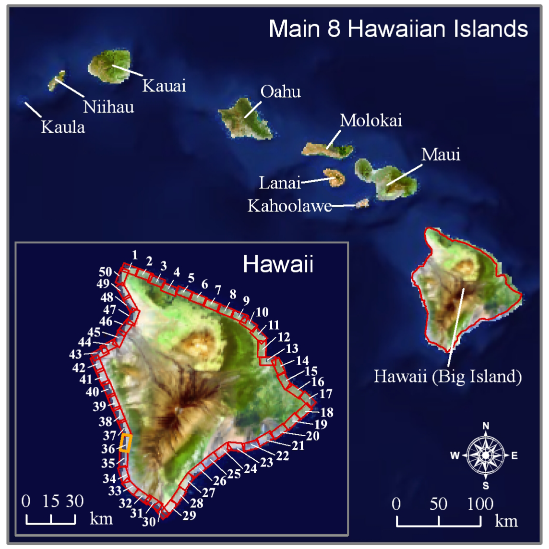
- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 36)


19°19'N
155°54'30"W
155°54'30"W
Frame 35
Frame 37
19°15'30"N
19°19'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- 🟦 Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

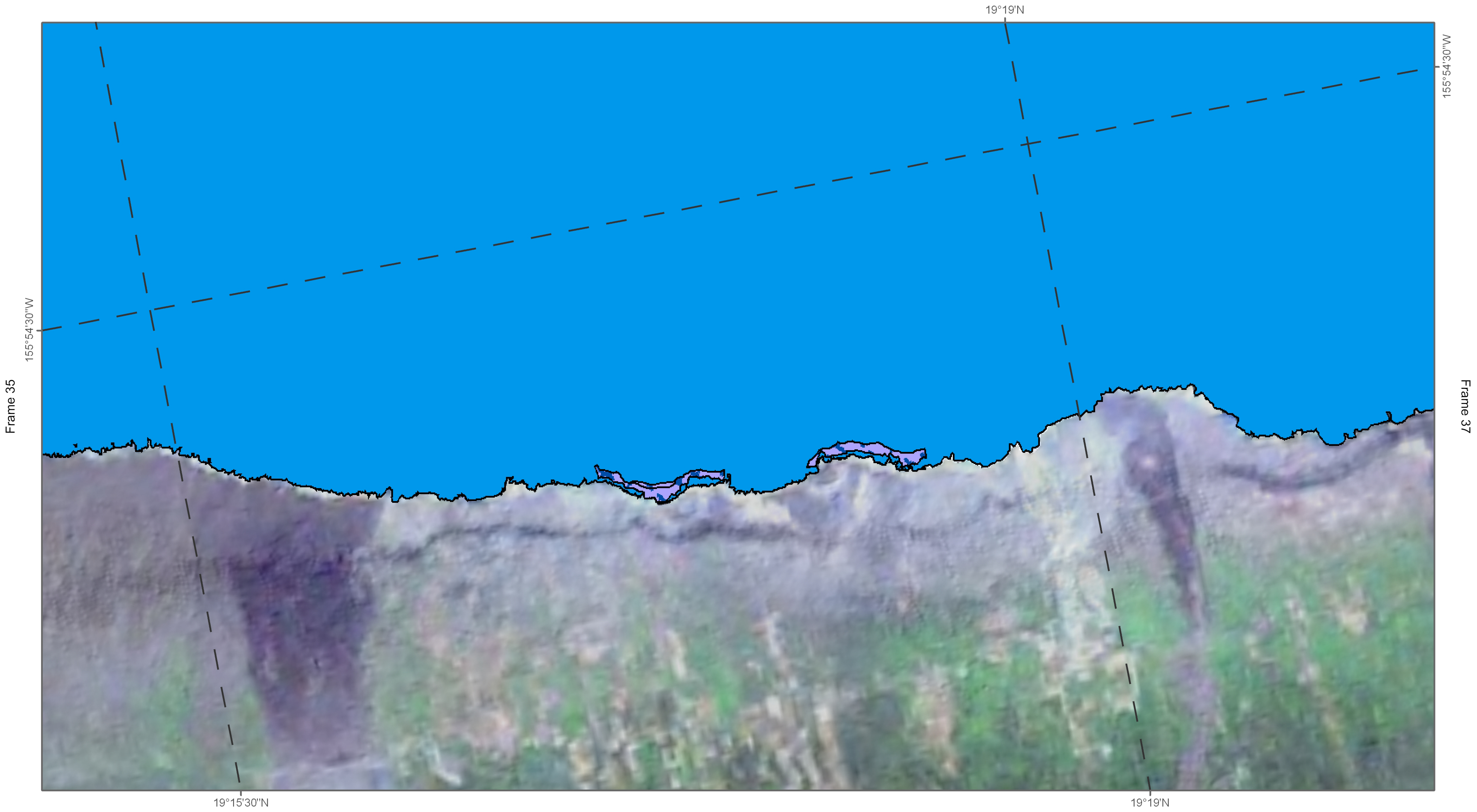
□ Minimum Mapping Unit (1 Acre)

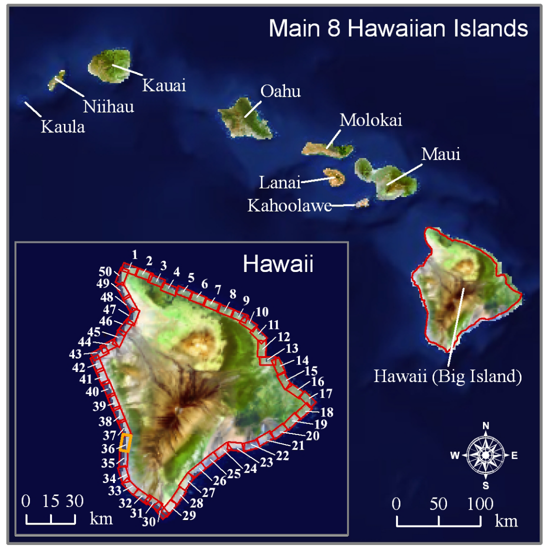
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 36)


19°19'N
155°54'30"W
155°54'30"W
Frame 35
Frame 37
19°15'30"N
19°19'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ■ Mud
- ■ Sand
- ■ Unknown

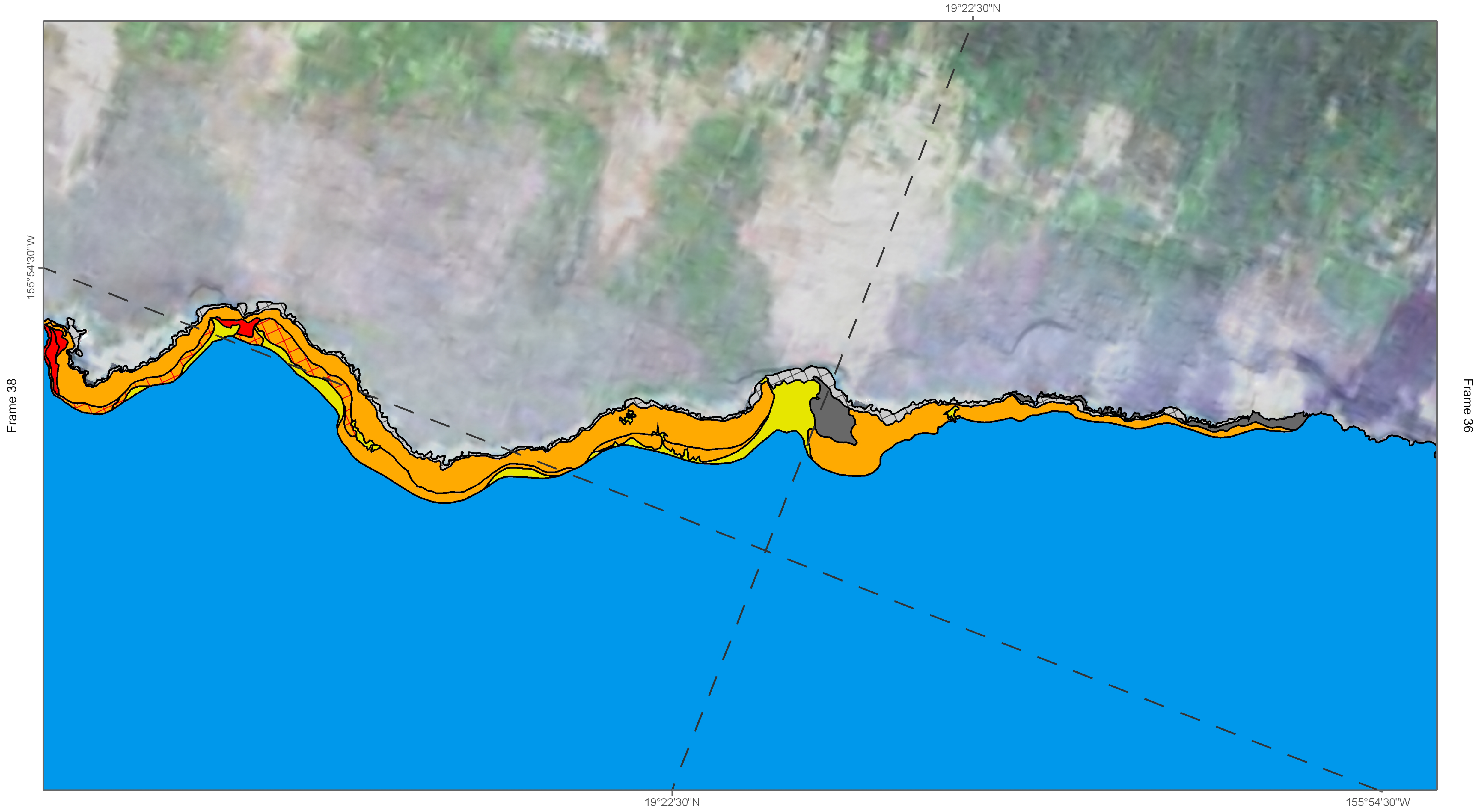
☐ Minimum Mapping Unit (1 Acre)

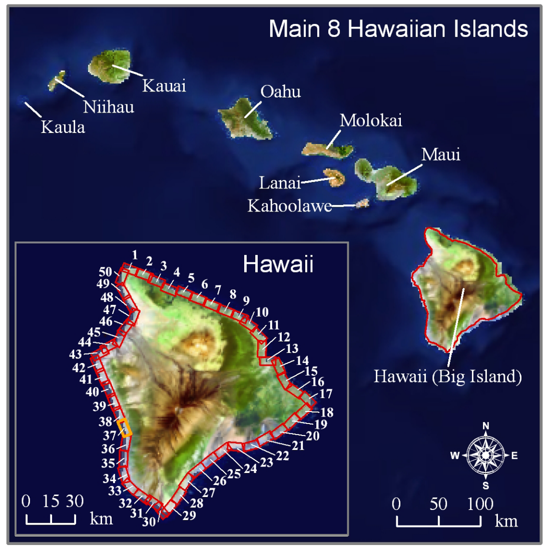
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 37)


19°22'30"N
155°54'30"W
Frame 38
Frame 36
19°22'30"N
155°54'30"W
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

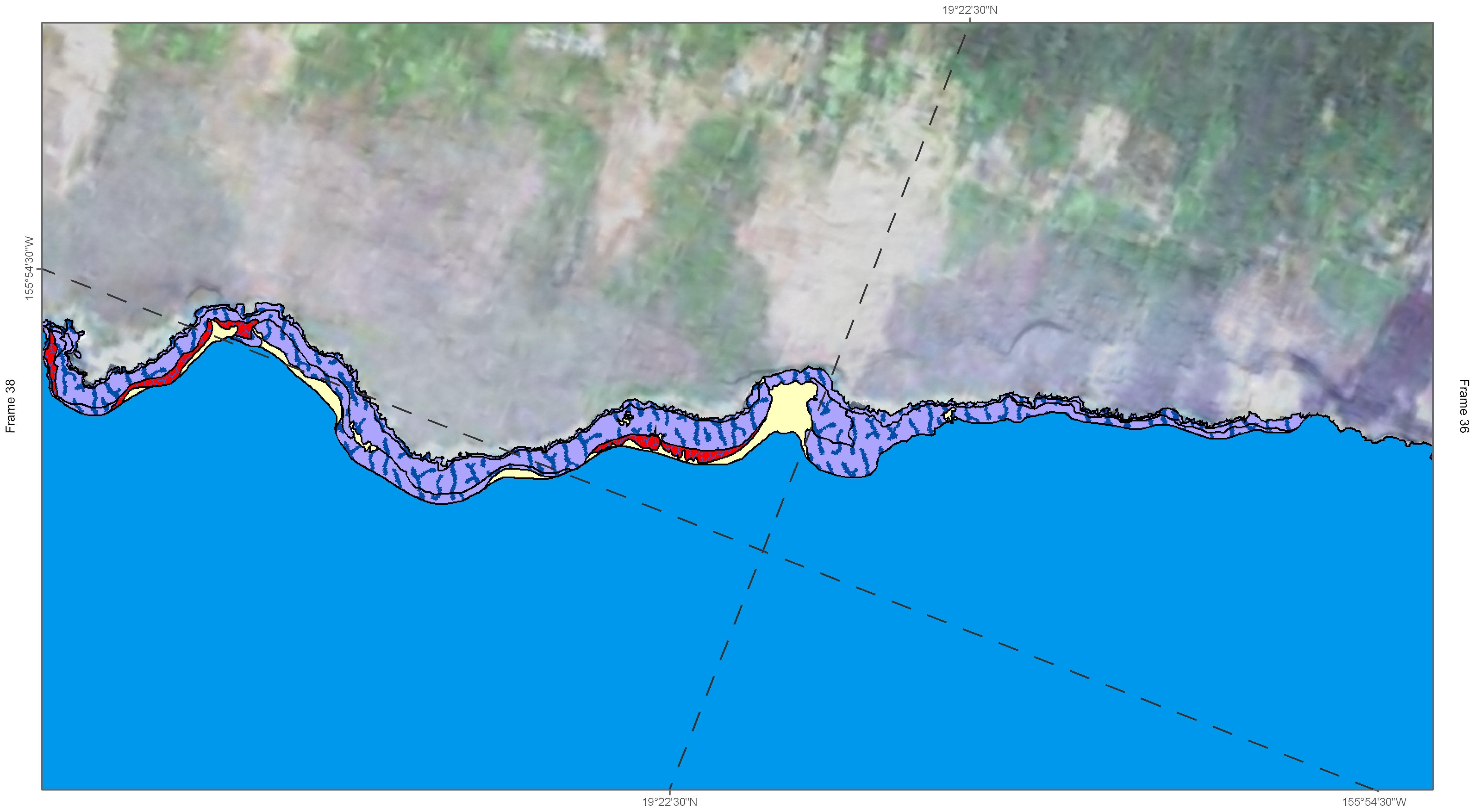
Biological Cover Types

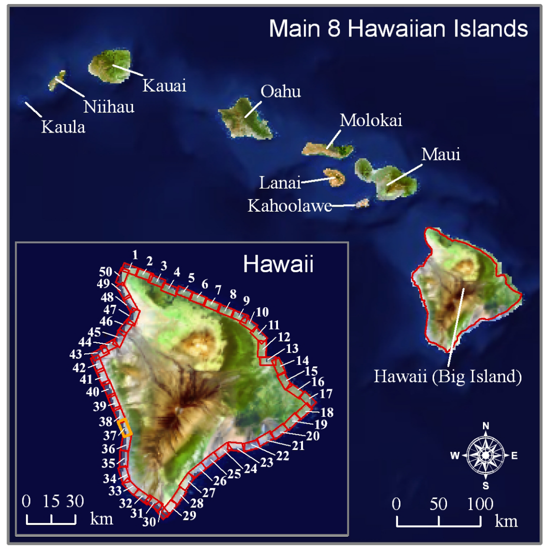
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 37)


19°22'30"N
155°54'30"W
Frame 38
Frame 36
19°22'30"N
155°54'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

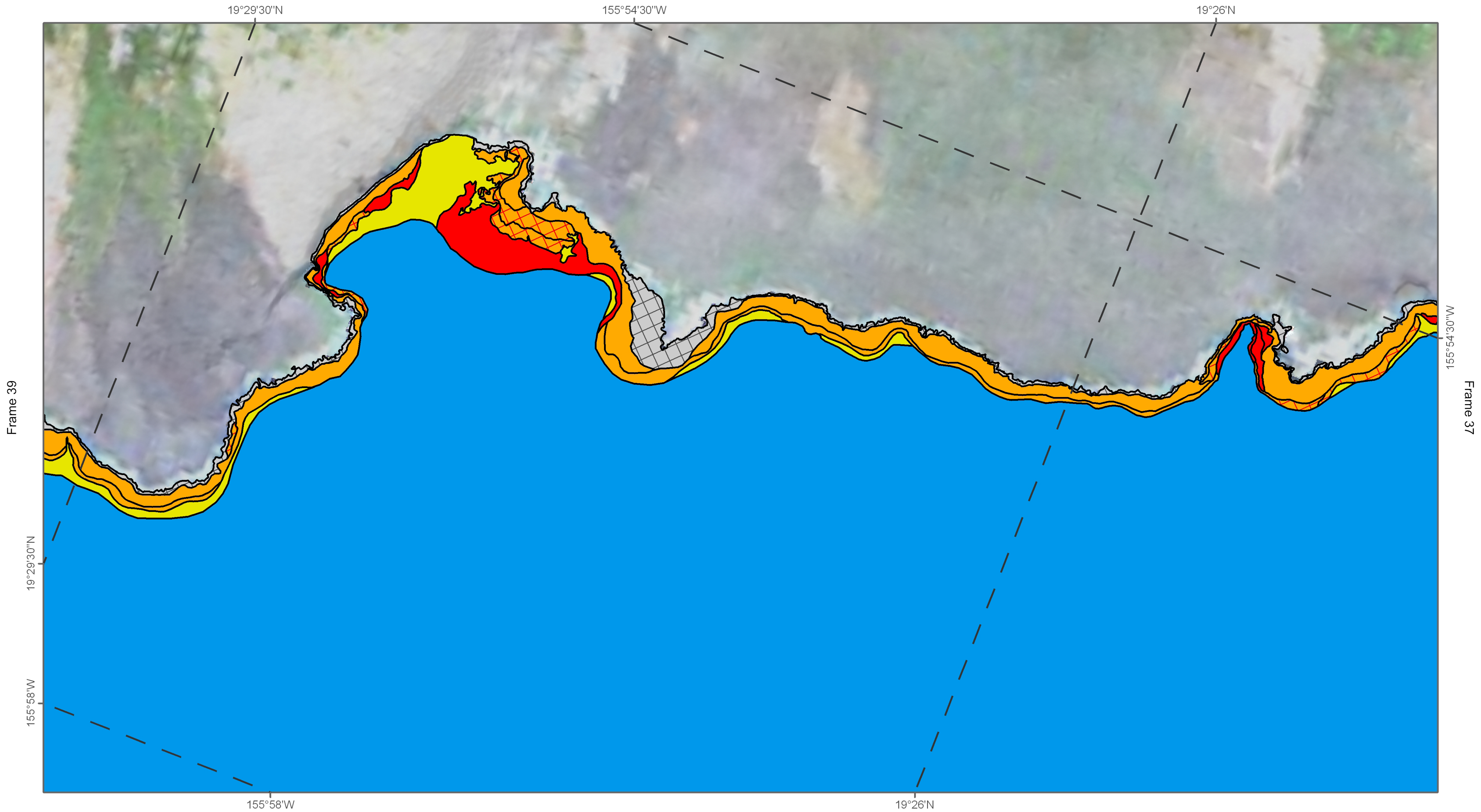
☐ Minimum Mapping Unit (1 Acre)

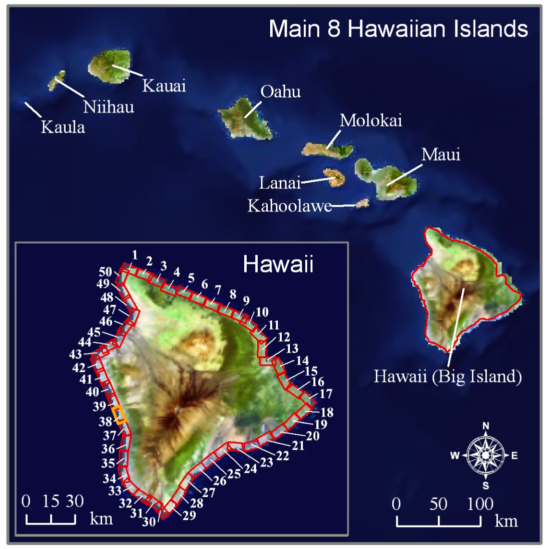
0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 38)


19°29'30"N
155°54'30"W
19°26'N
Frame 39
19°29'30"N
155°58'W
155°54'30"W
Frame 37
155°58'W
19°26'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

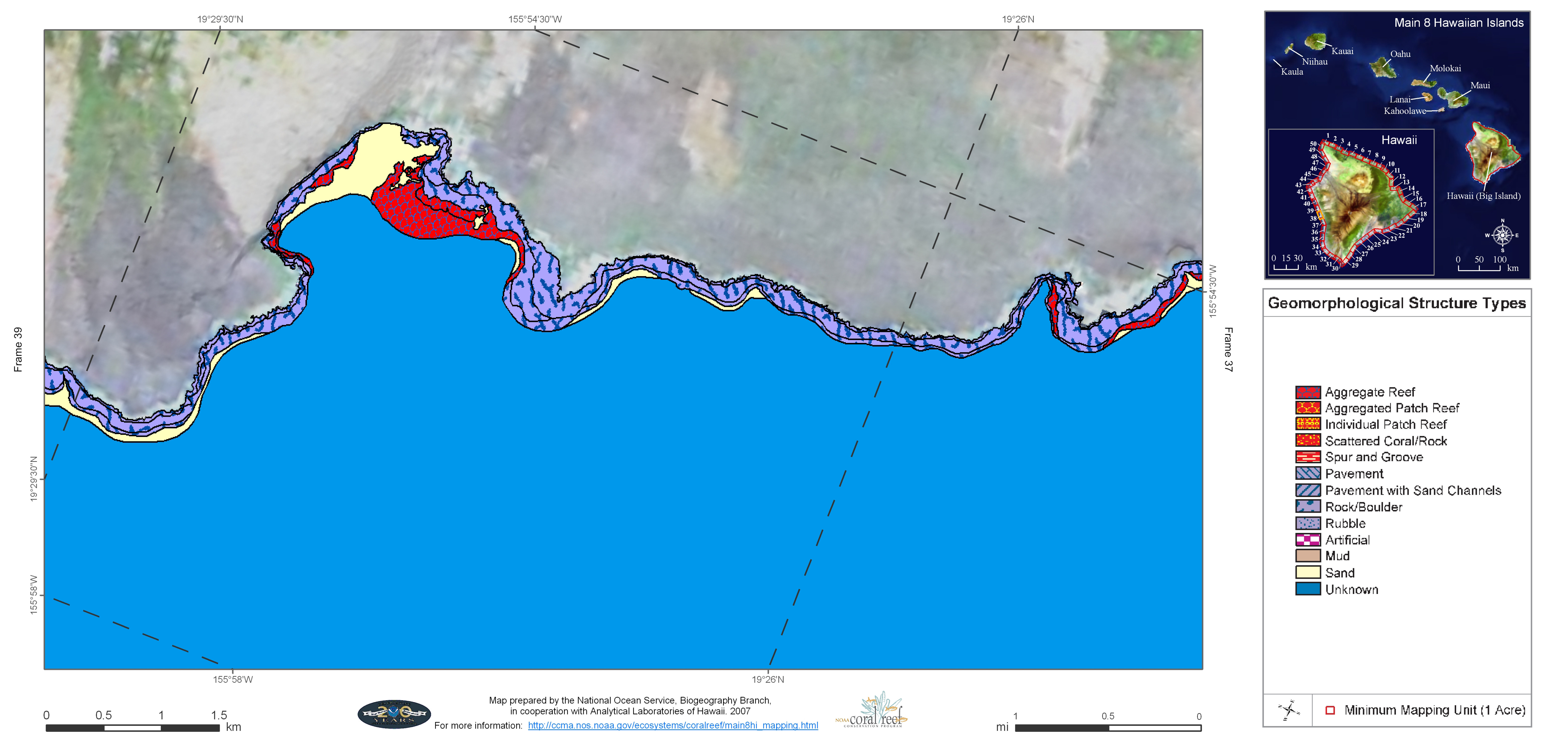
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

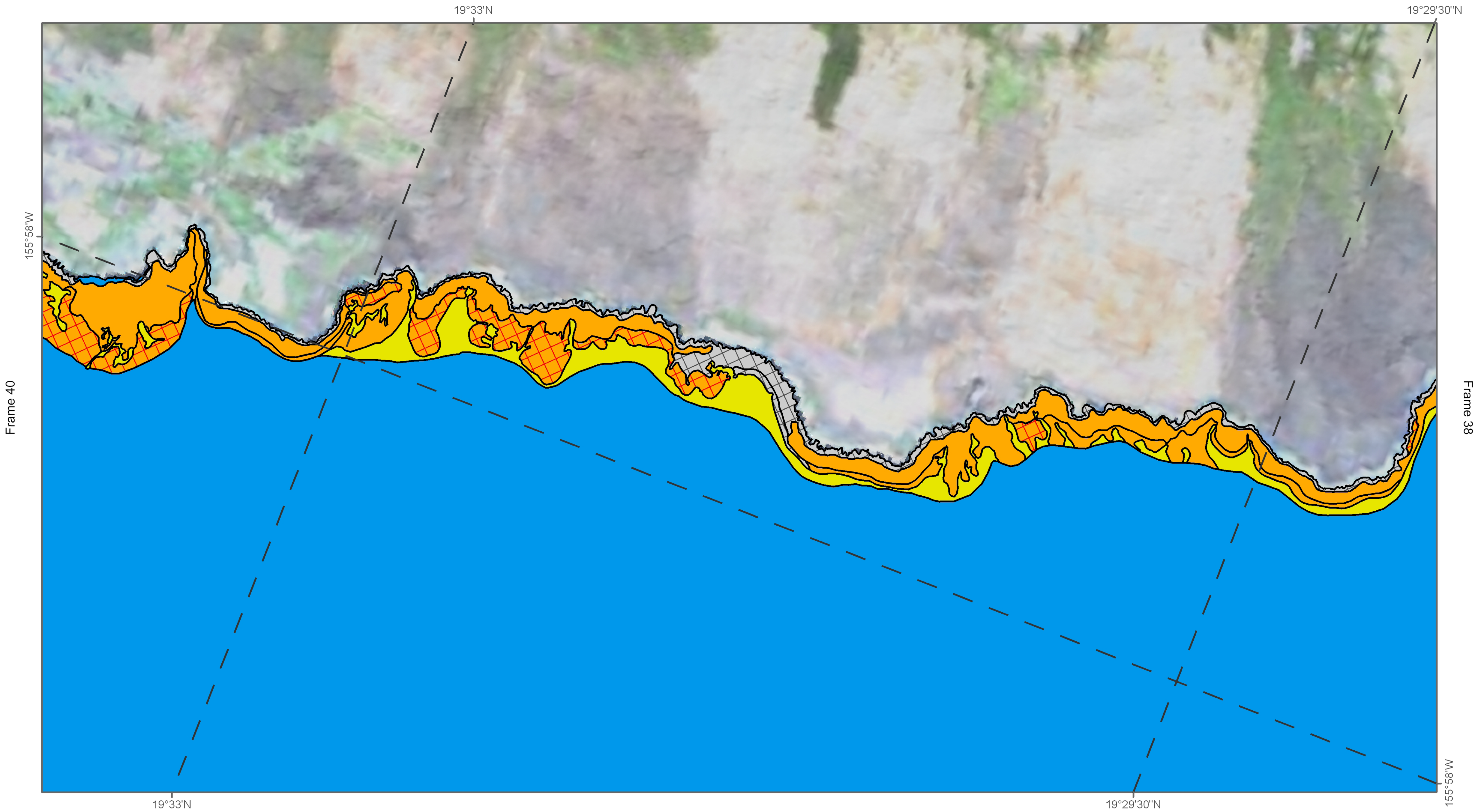
1 0.5 0 mi

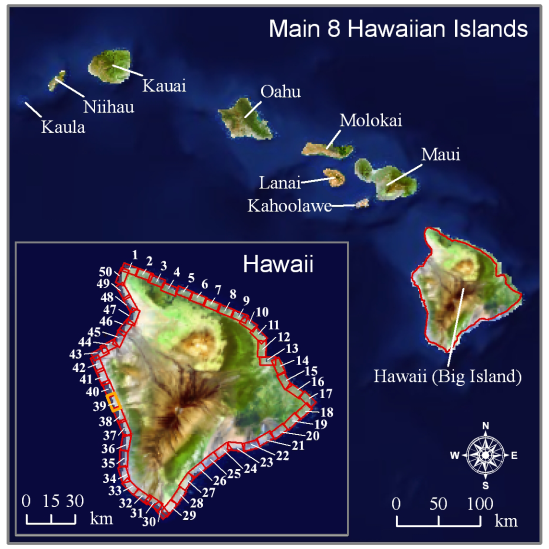
Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 38)


19°29'30"N
155°54'30"W
19°26'N
Frame 39
19°29'30"N
155°58'W
155°54'30"W
Frame 37
155°58'W
19°26'N
0
0.5
1
1.5
km
1
0.5
0
mi
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
W
E
S
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 39)


19°33'N
19°29'30"N
155°58'W
Frame 40
Frame 38
19°33'N
19°29'30"N
155°58'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

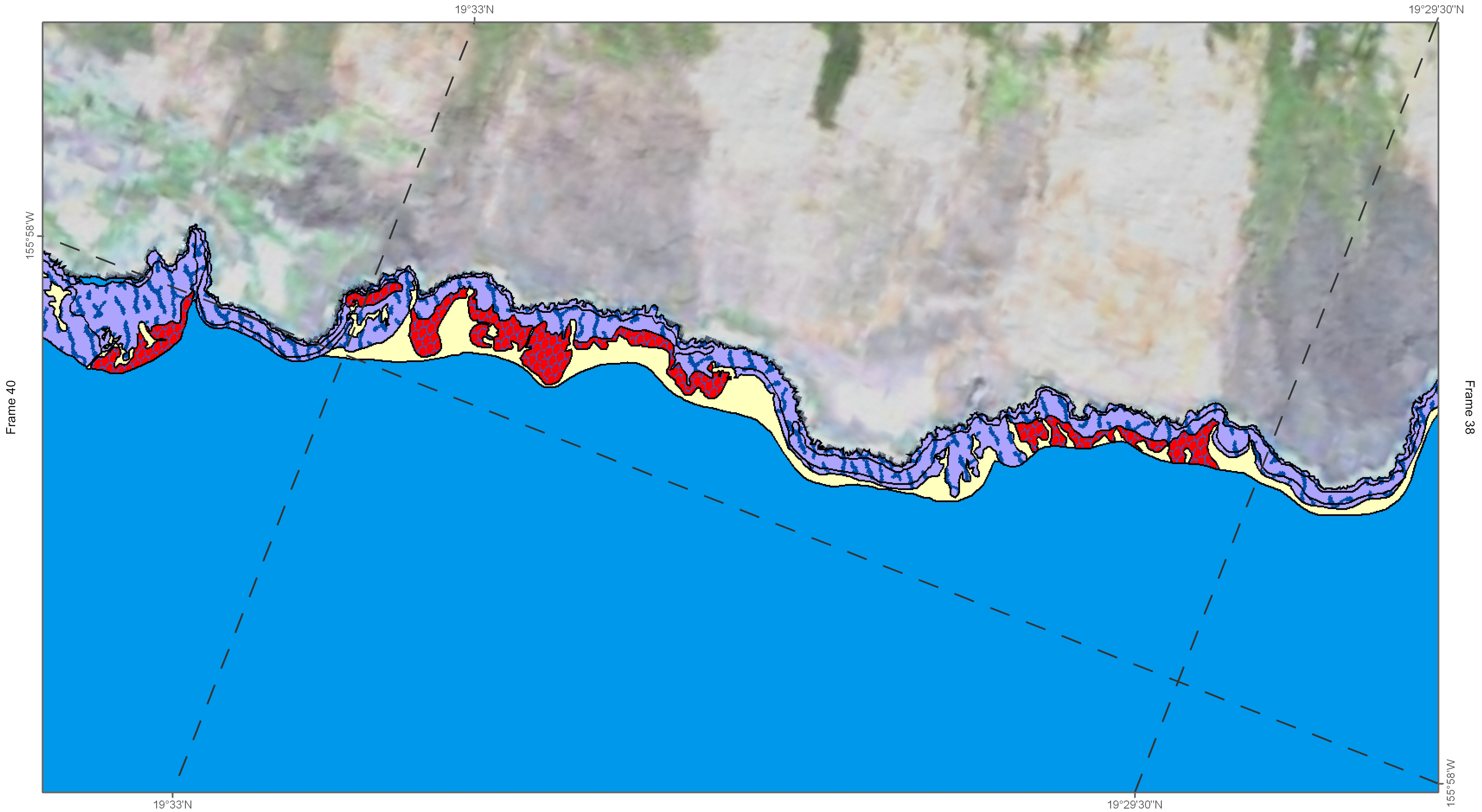
☐ Minimum Mapping Unit (1 Acre)

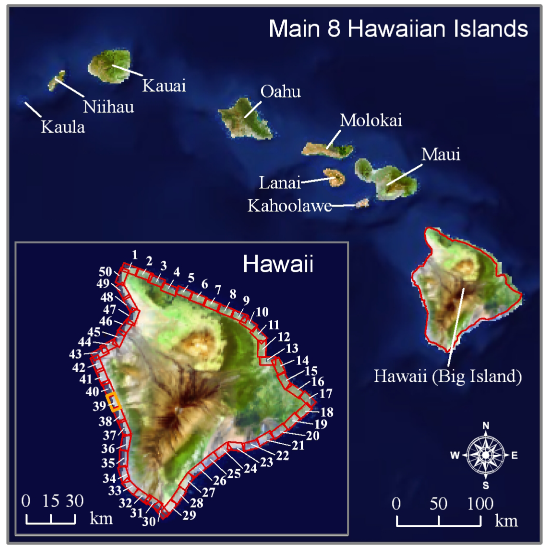
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 39)


19°33'N
19°29'30"N
155°58'W
Frame 40
Frame 38
155°58'W
19°33'N
19°29'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

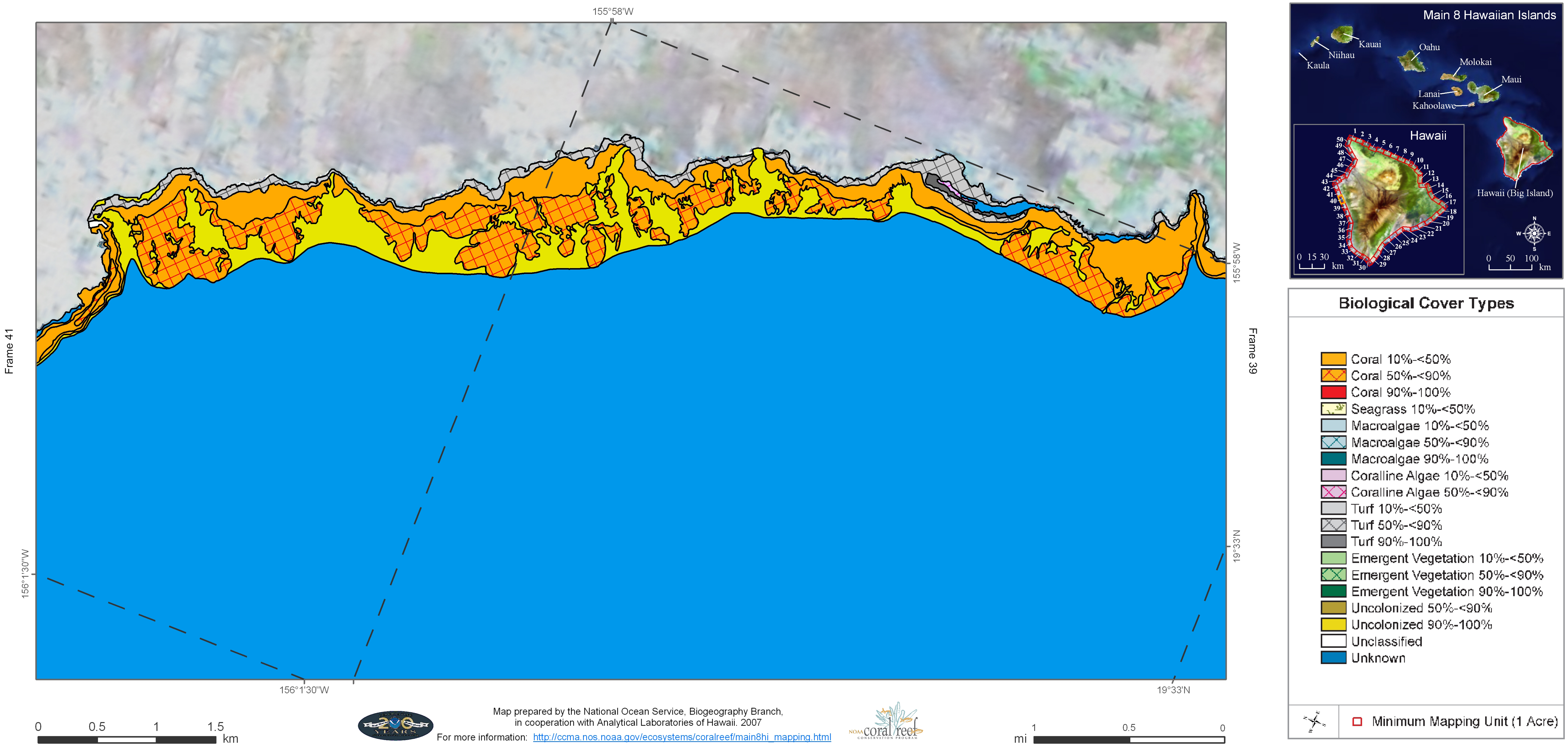
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

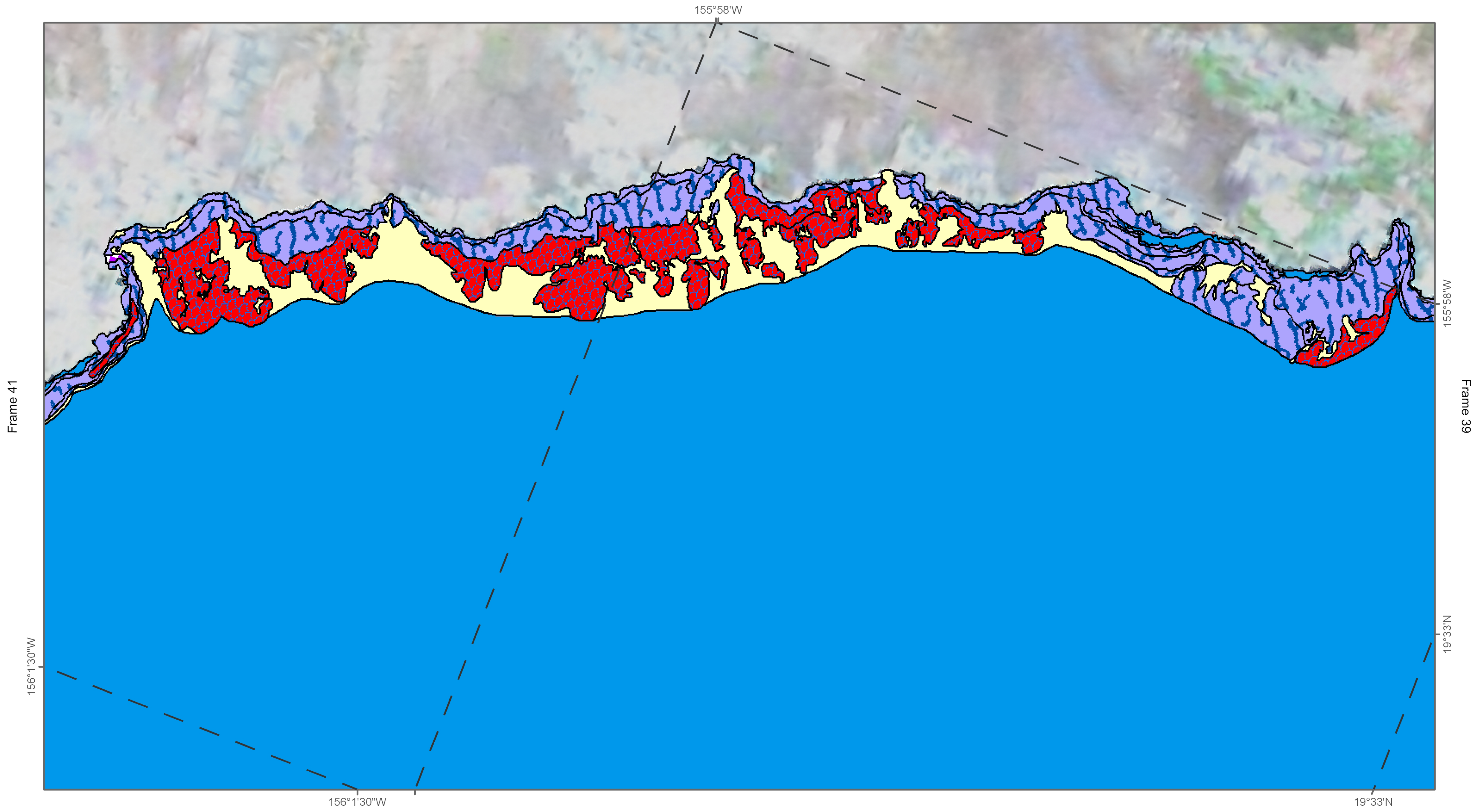
mi 1 0.5 0

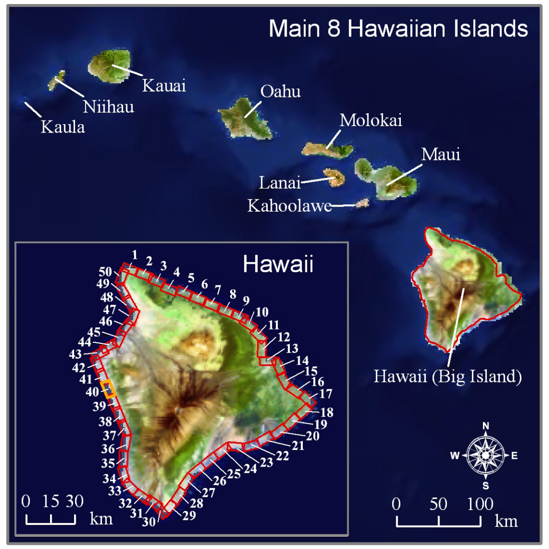
Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 40)


155°58'W
Frame 41
156°1'30"W
156°1'30"W
155°58'W
Frame 39
19°33'N
19°33'N
0
0.5
1
1.5
km
1
0.5
0
mi
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
S
E
W
Biological Cover Types
Coral 10%-<50%
Coral 50%-<90%
Coral 90%-100%
Seagrass 10%-<50%
Macroalgae 10%-<50%
Macroalgae 50%-<90%
Macroalgae 90%-100%
Coralline Algae 10%-<50%
Coralline Algae 50%-<90%
Turf 10%-<50%
Turf 50%-<90%
Turf 90%-100%
Emergent Vegetation 10%-<50%
Emergent Vegetation 50%-<90%
Emergent Vegetation 90%-100%
Uncolonized 50%-<90%
Uncolonized 90%-100%
Unclassified
Unknown
Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 40)


155°58'W
Frame 41
156°1'30"W
155°58'W
Frame 39
19°33'N
156°1'30"W
19°33'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
Hawaii (Big Island)
N
E
S
W
0 50 100 km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- 🟪 Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

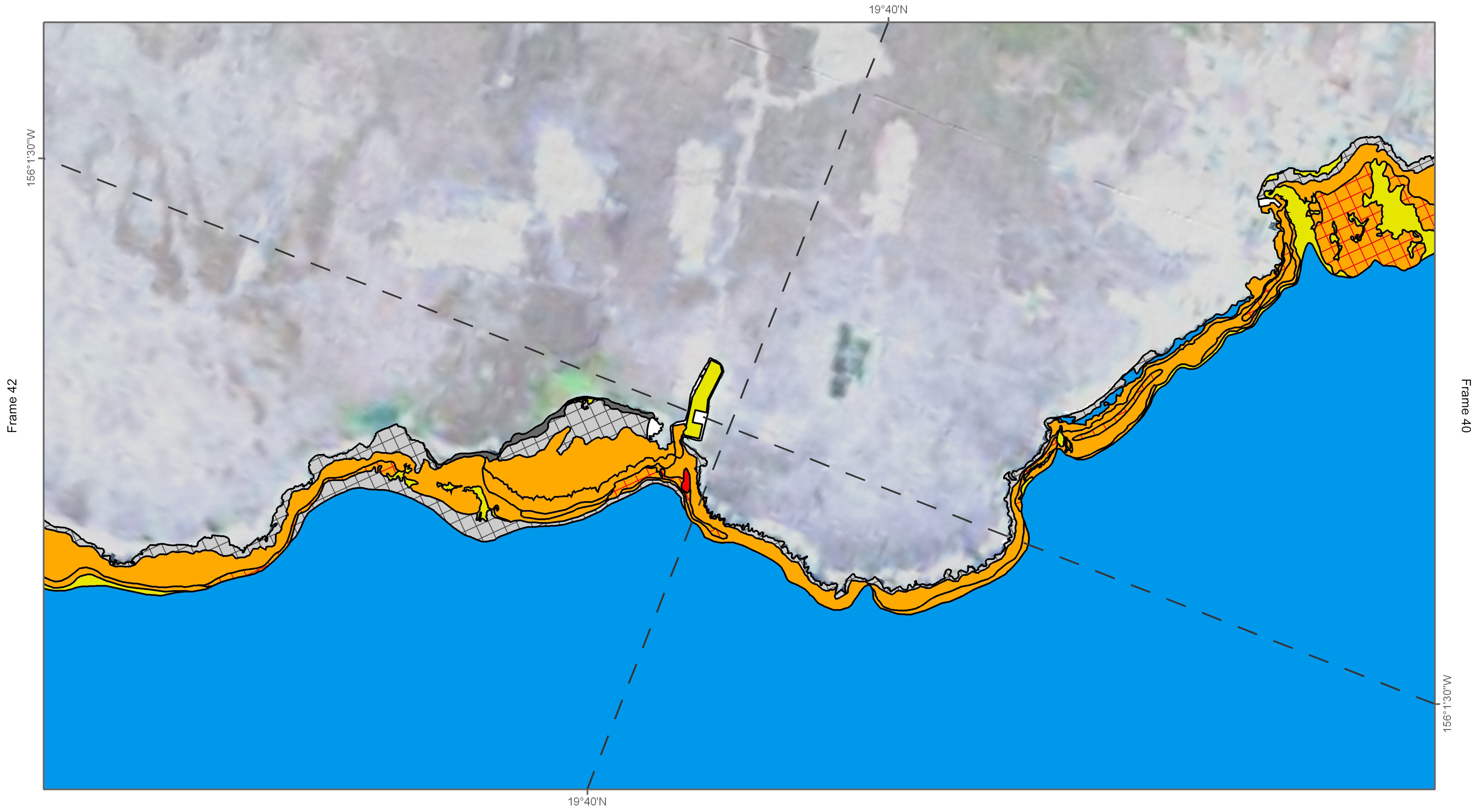
☐ Minimum Mapping Unit (1 Acre)

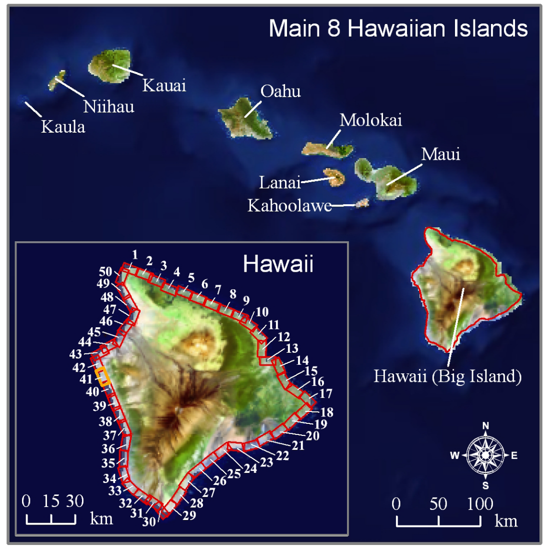
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 41)


19°40'N
156°1'30"W
Frame 42
Frame 40
156°1'30"W
19°40'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▢ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▢ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▢ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ▢ Unclassified
- 🟦 Unknown

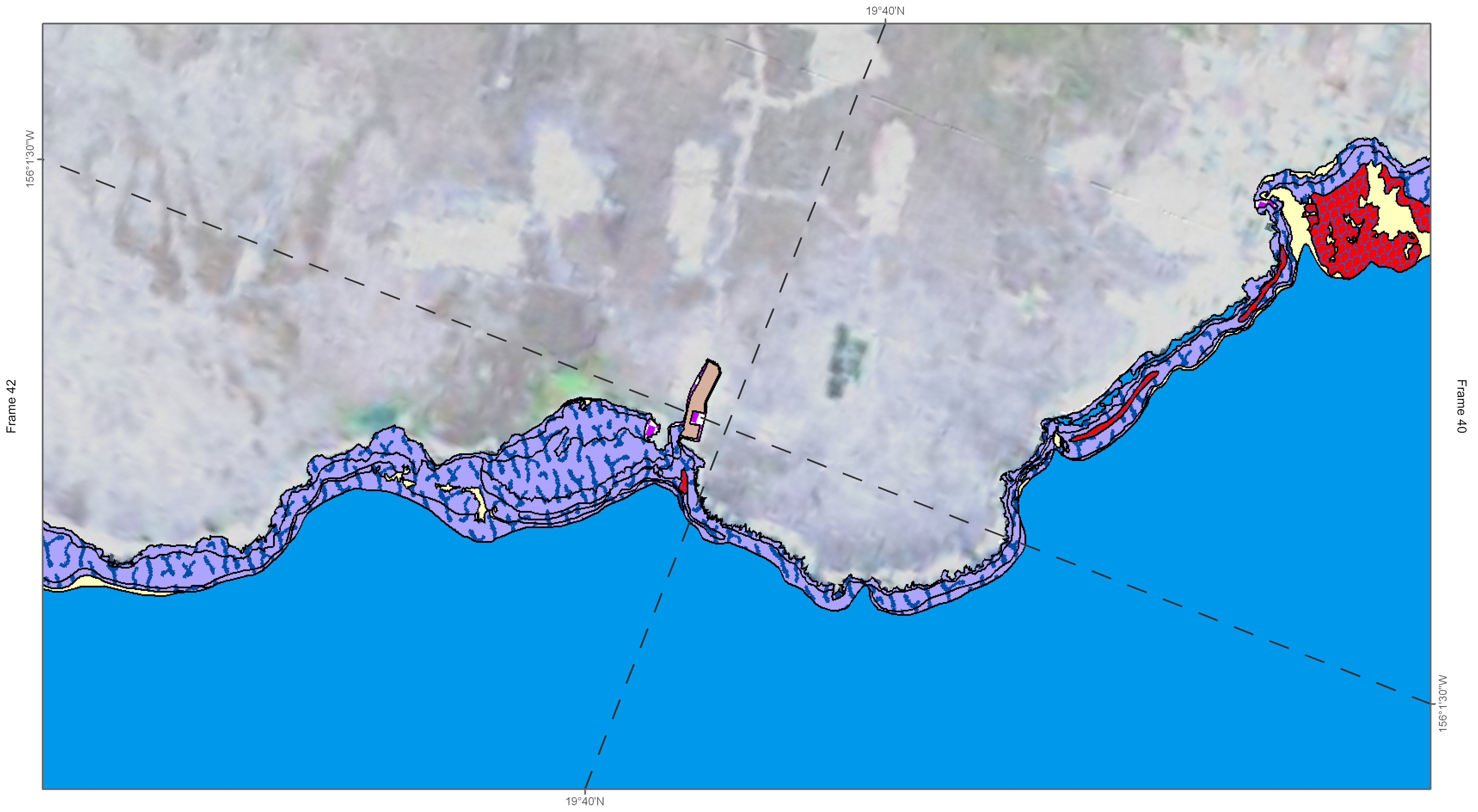
▢ Minimum Mapping Unit (1 Acre)

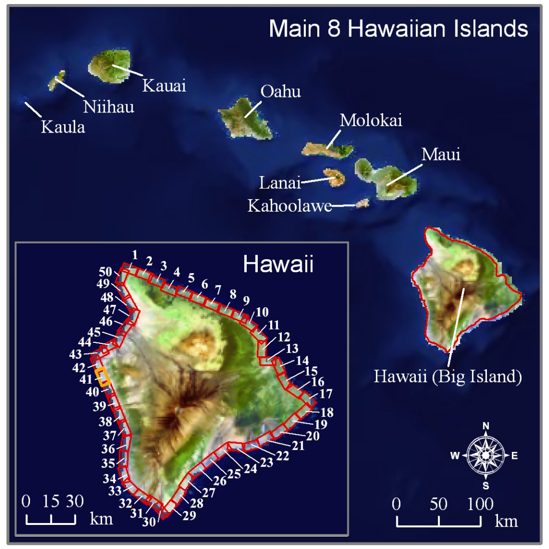
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 41)


19°40'N
156°1'30"W
Frame 42
Frame 40
156°1'30"W
19°40'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

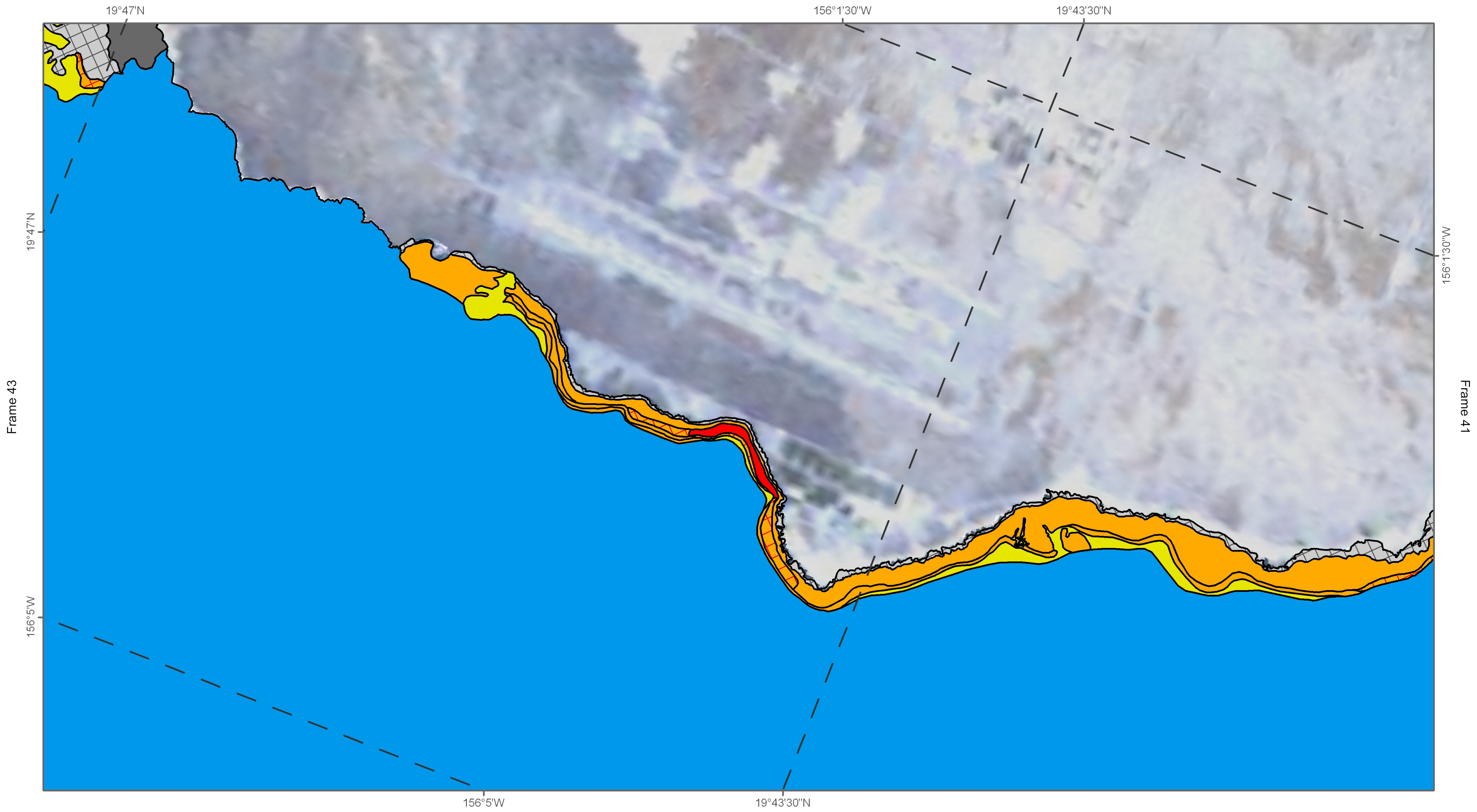
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

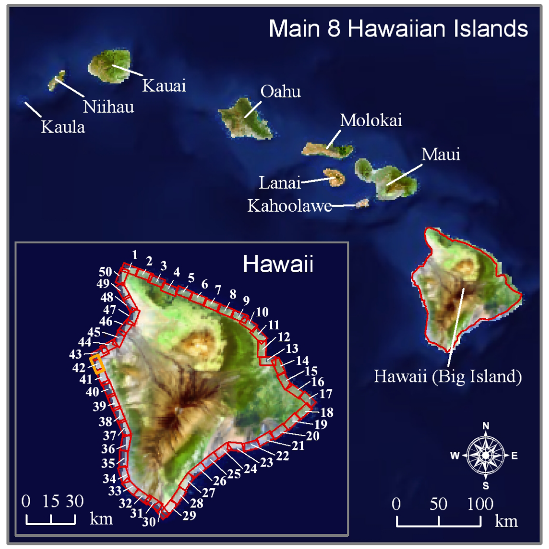
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 42)


19°47'N
156°1'30"W
19°43'30"N
19°47'N
156°1'30"W
Frame 43
Frame 41
156°5'W
156°5'W
19°43'30"N

0 0.5 1 1.5 km


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N
W
E
S

Biological Cover Types

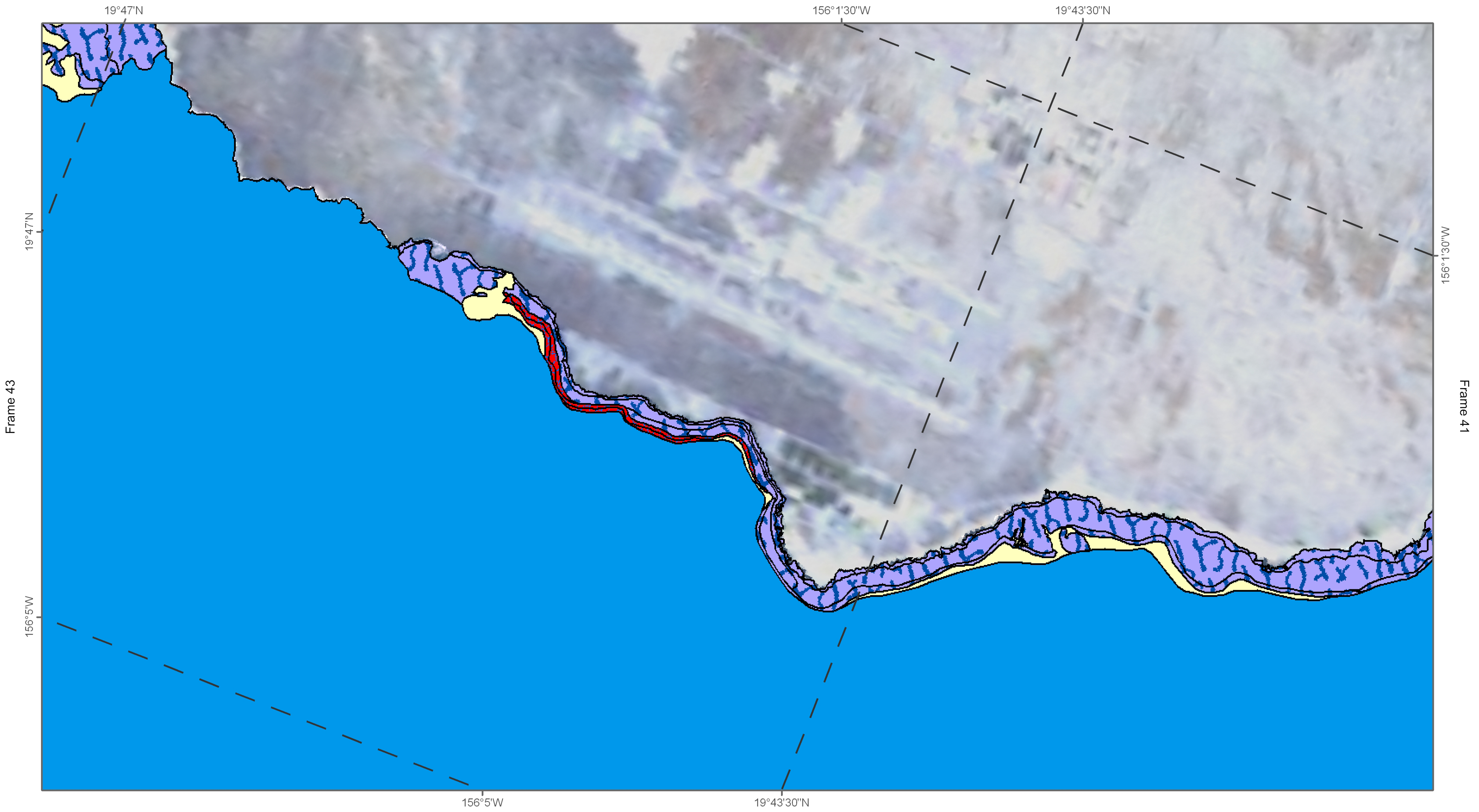
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

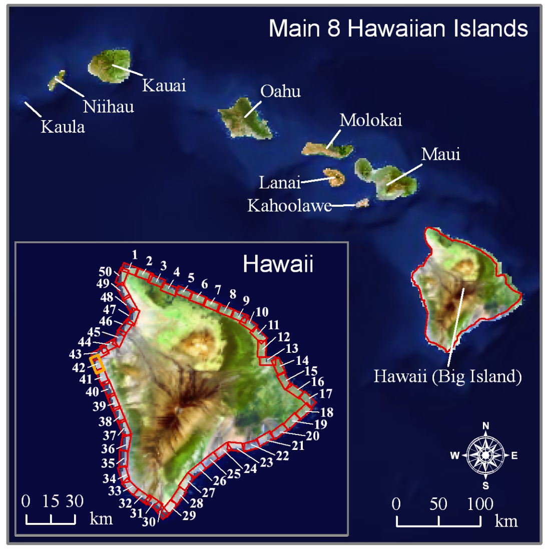
□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 42)


19°47'N
156°1'30"W
19°43'30"N
19°47'N
156°5'W
Frame 43
156°1'30"W
Frame 41
156°5'W
19°43'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
S
E
W

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

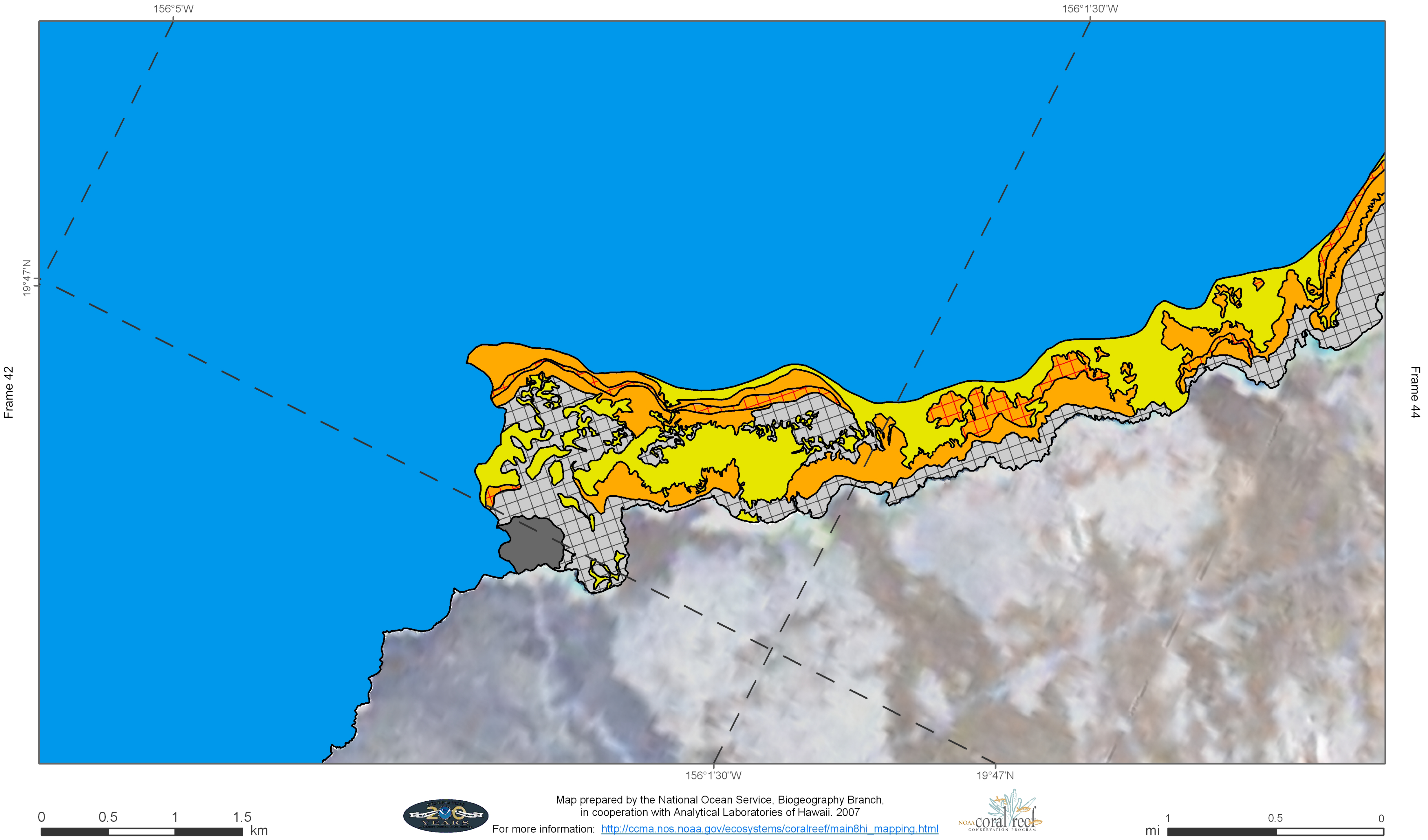
□ Minimum Mapping Unit (1 Acre)

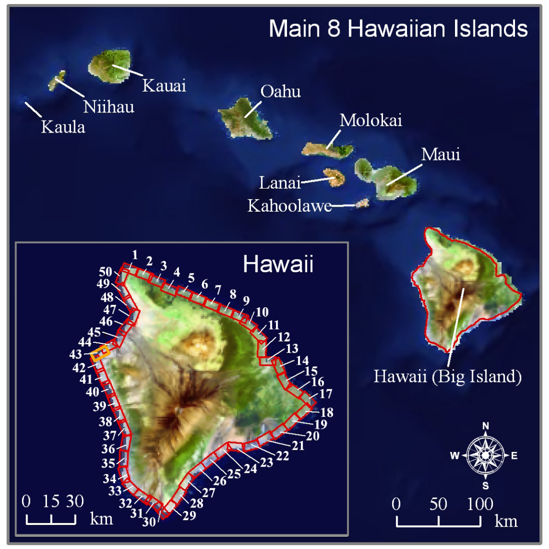
0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii, 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 43)


156°5'W
156°1'30"W
19°47'N
Frame 42
Frame 44
156°1'30"W
19°47'N
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
W
E
S

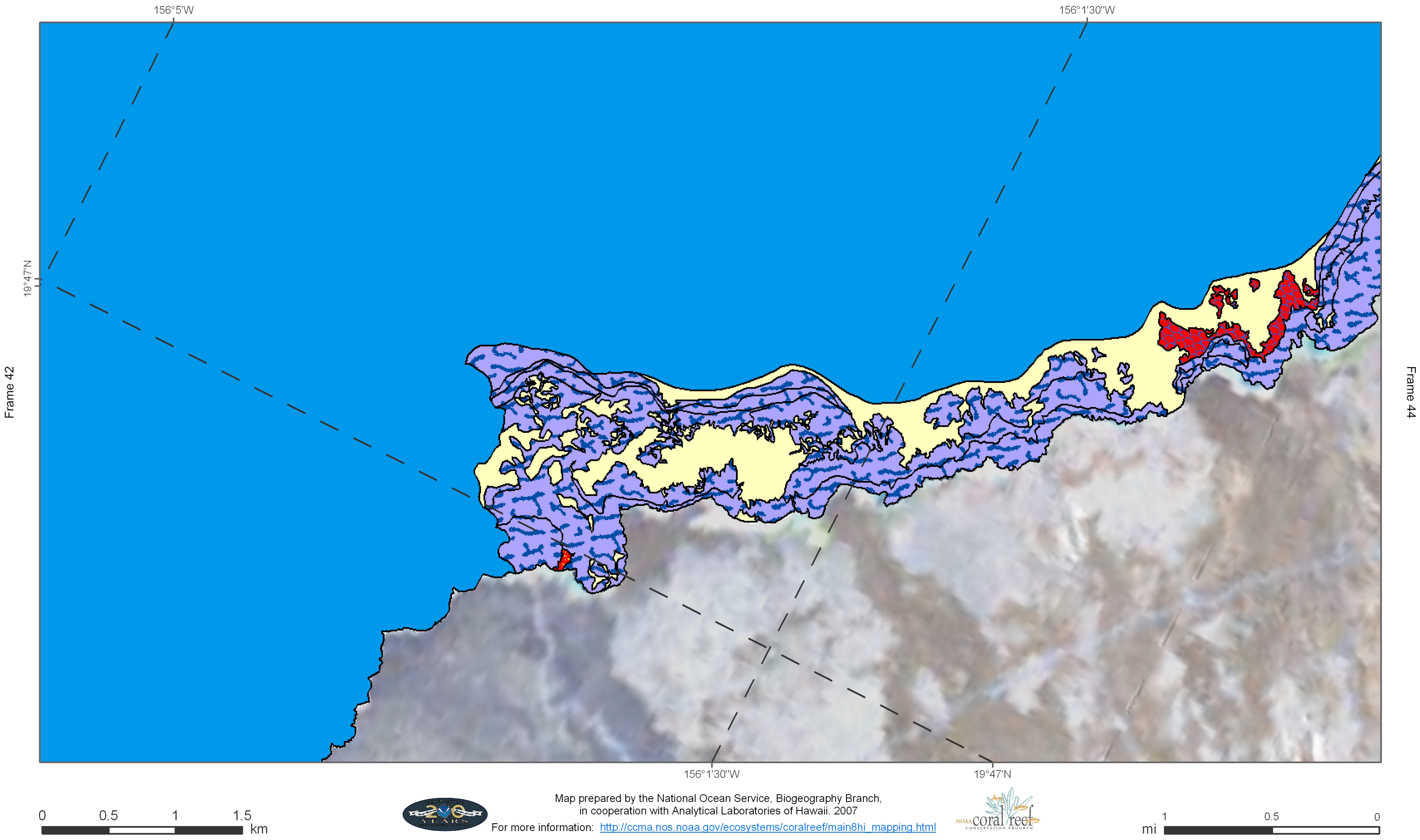
Biological Cover Types

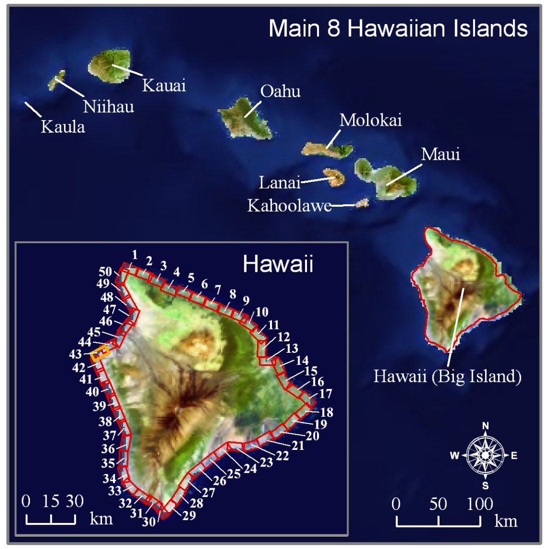
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 43)


156°5'W
156°1'30"W
19°47'N
Frame 42
Frame 44
156°1'30"W
19°47'N
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km

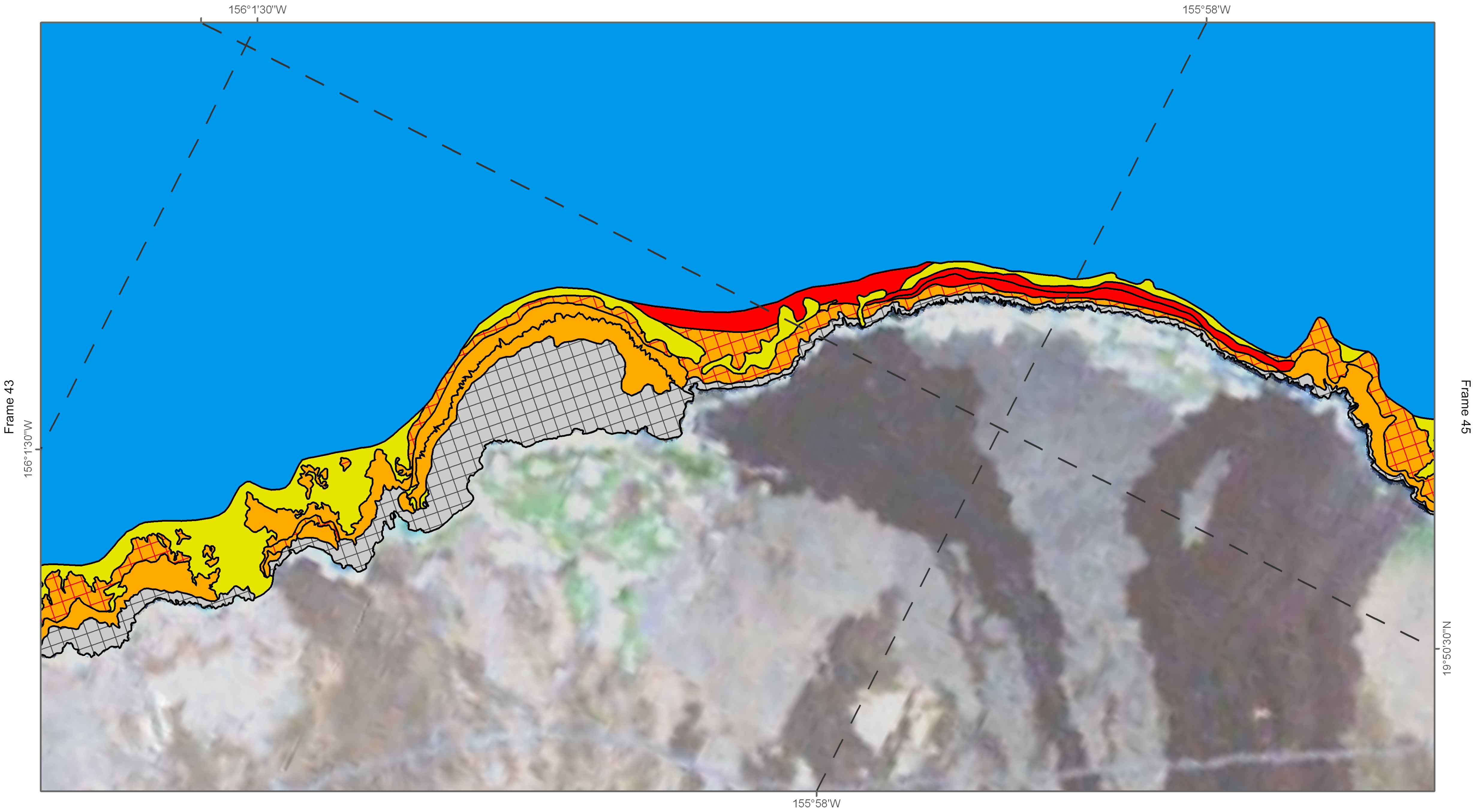
Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

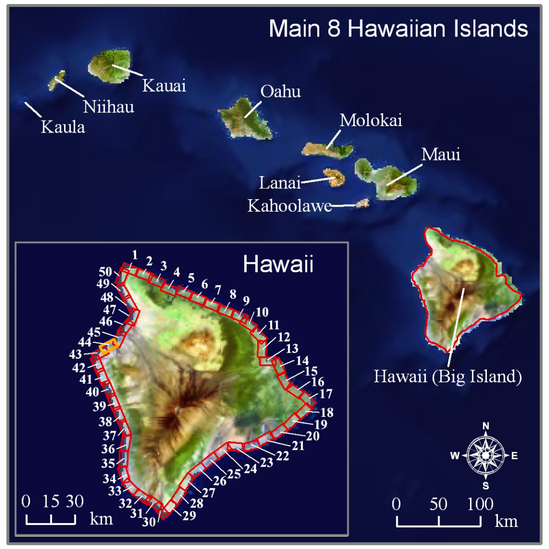
☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 44)



156°1'30"W
155°58'W
Frame 43
156°1'30"W
Frame 45
19°50'30"N
155°58'W



Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
Hawaii (Big Island)
N
E
S
W
0 50 100 km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- 🟦 Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

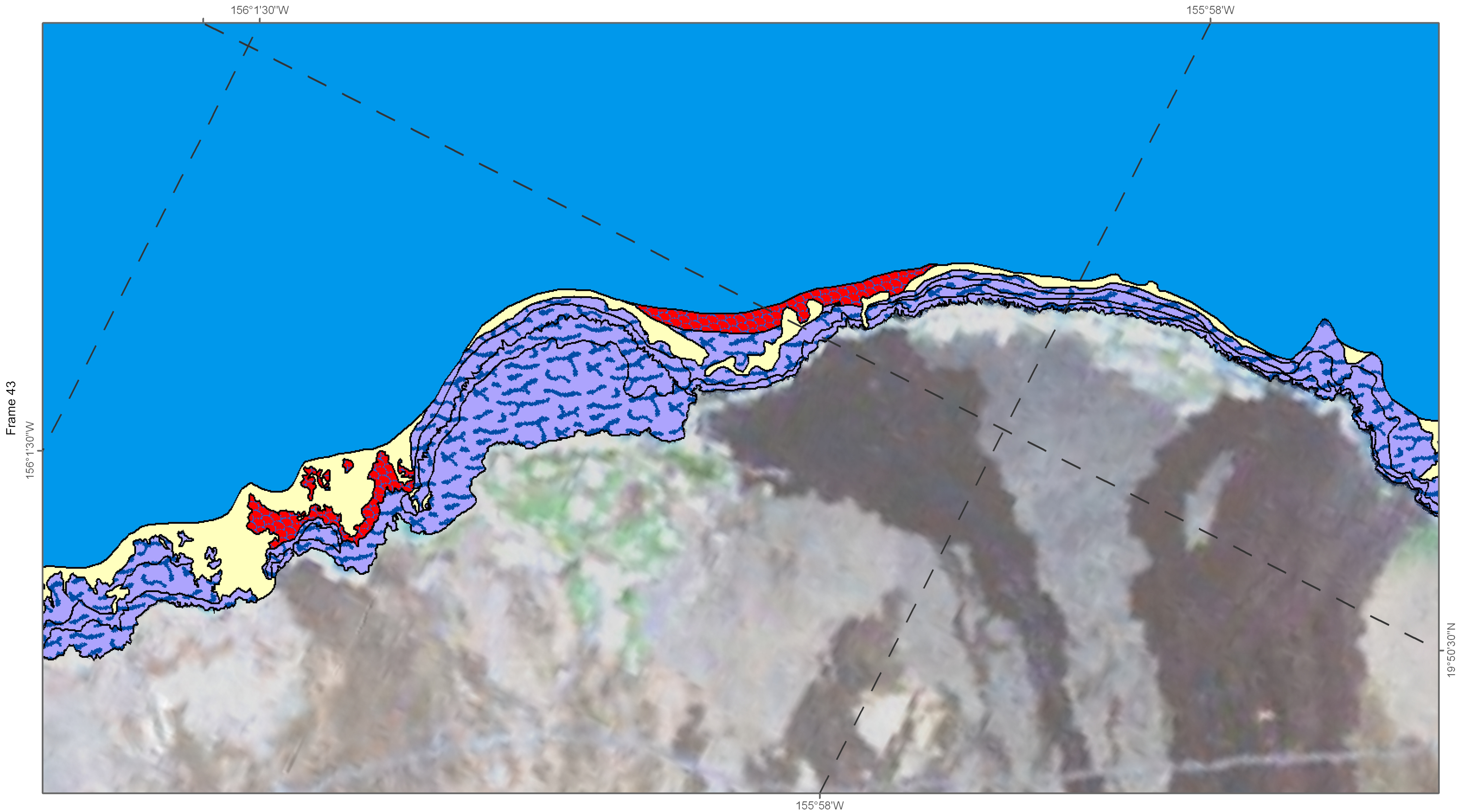
□ Minimum Mapping Unit (1 Acre)

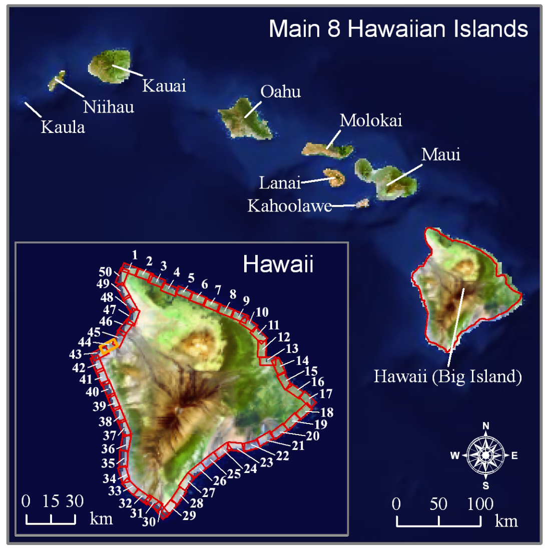
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 44)


156°1'30"W
155°58'W
Frame 43
156°1'30"W
Frame 45
19°50'30"N
155°58'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

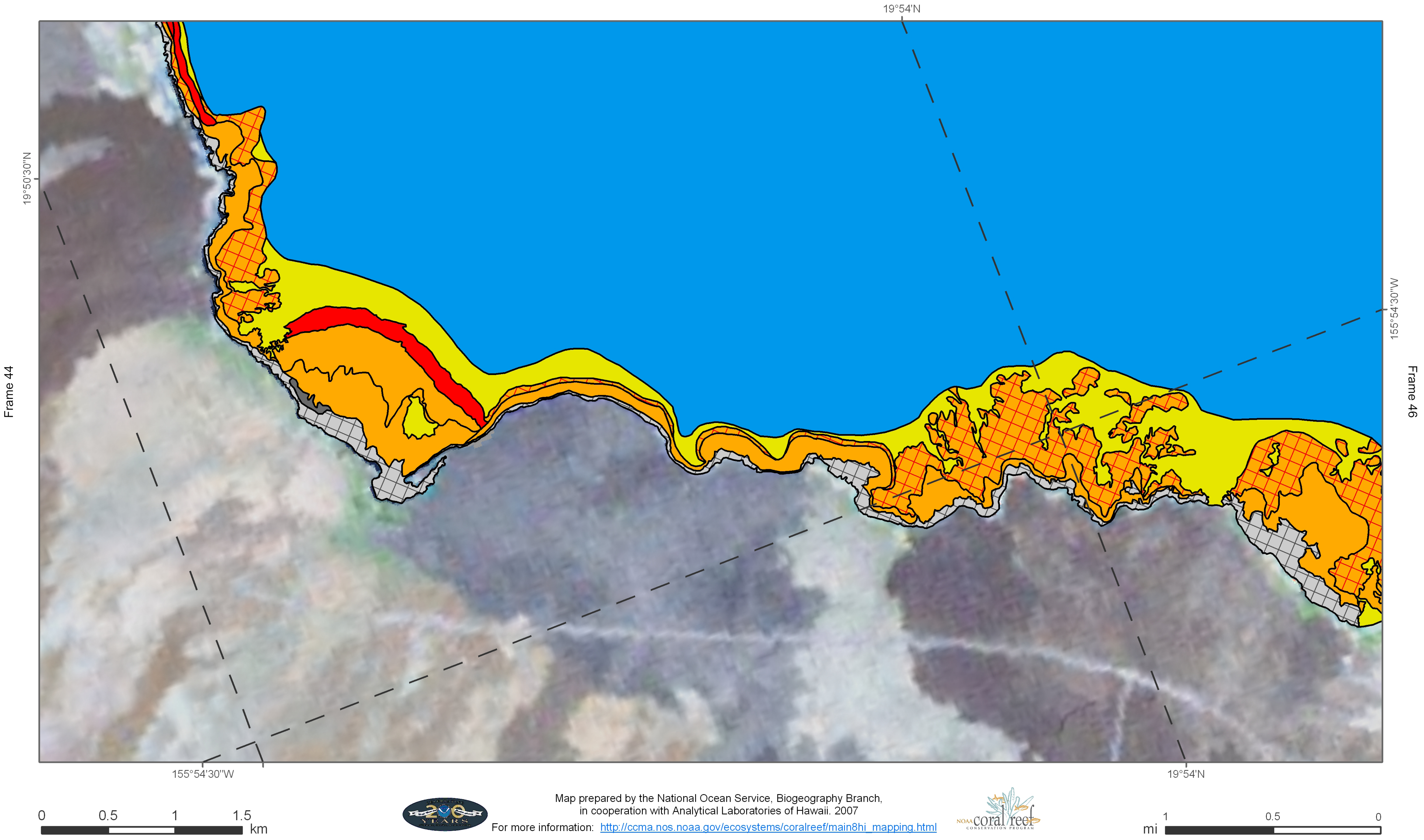
□ Minimum Mapping Unit (1 Acre)

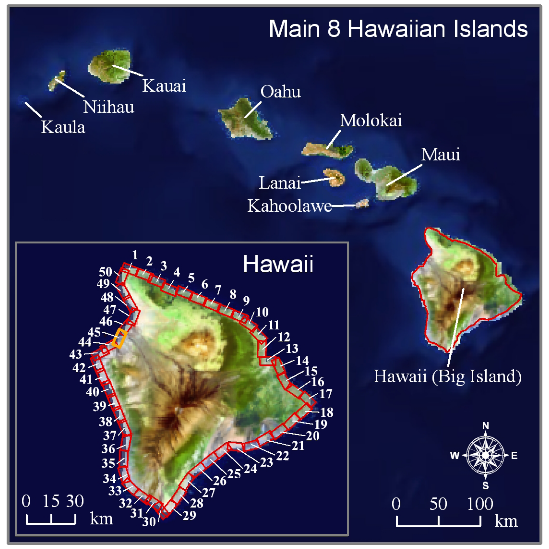
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 45)


19°54'N
19°50'30"N
155°54'30"W
Frame 44
Frame 46
155°54'30"W
19°54'N
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
S
E
W

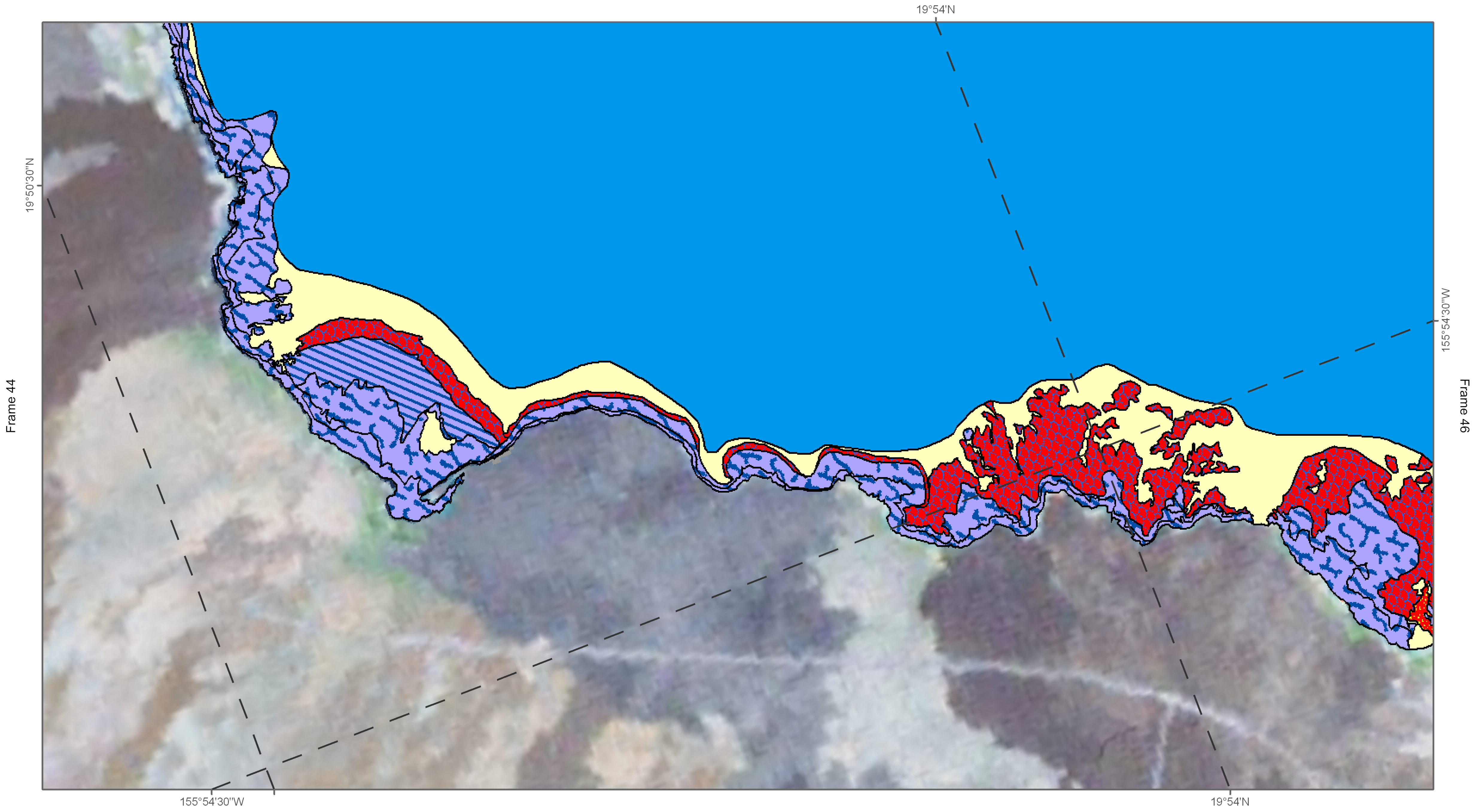
Biological Cover Types

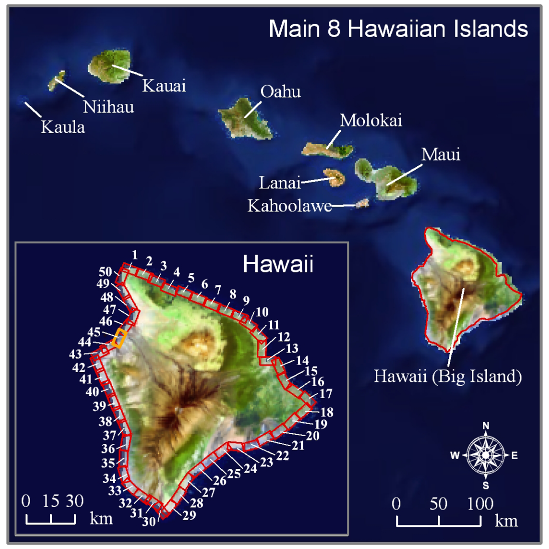
- ■ Coral 10%-<50%
- ▨ Coral 50%-<90%
- ■ Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- ■ Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- ■ Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- ■ Uncolonized 90%-100%
- ☐ Unclassified
- ■ Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 45)


19°54'N
19°50'30"N
Frame 44
155°54'30"W
Frame 46
155°54'30"W
19°54'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

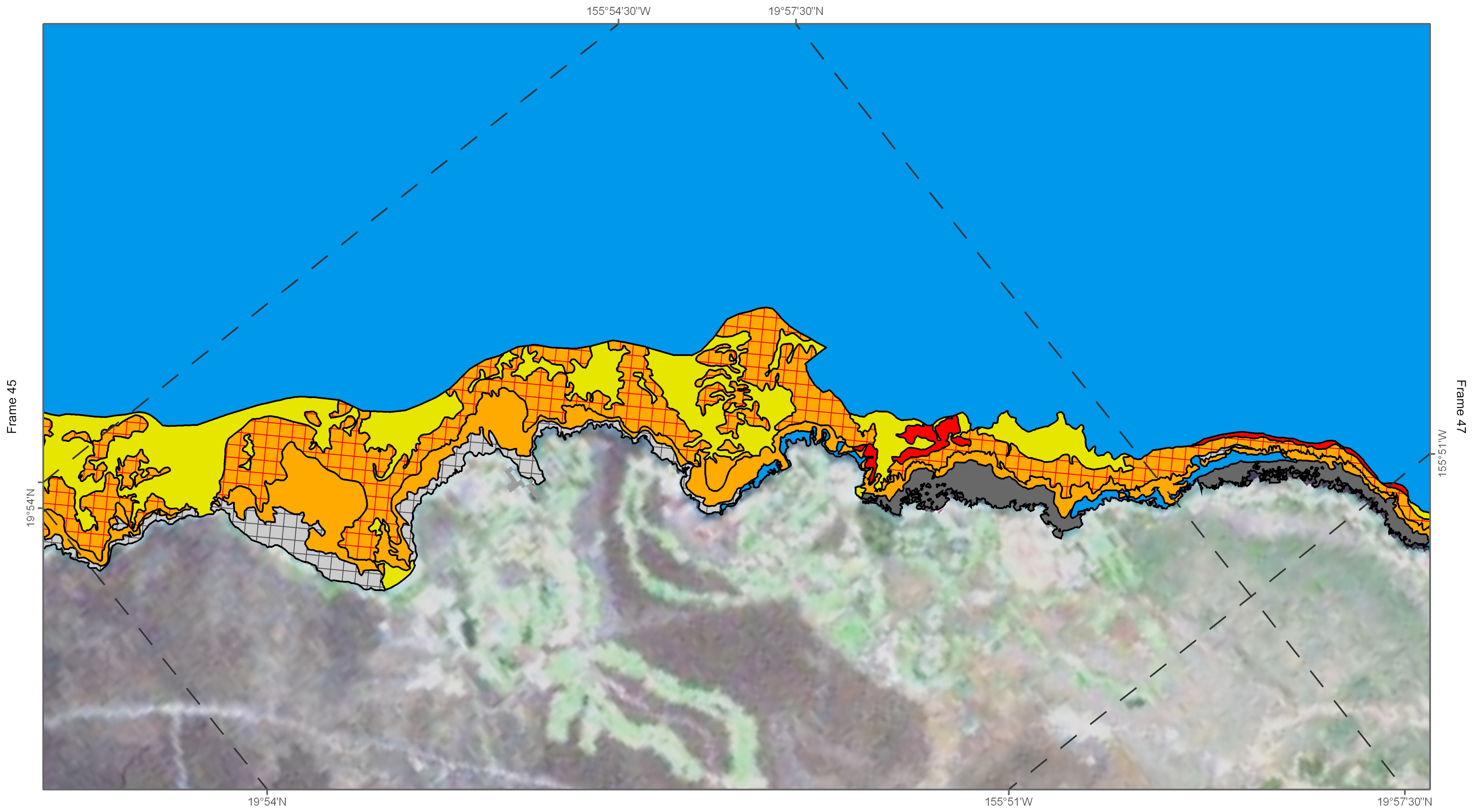
☐ Minimum Mapping Unit (1 Acre)

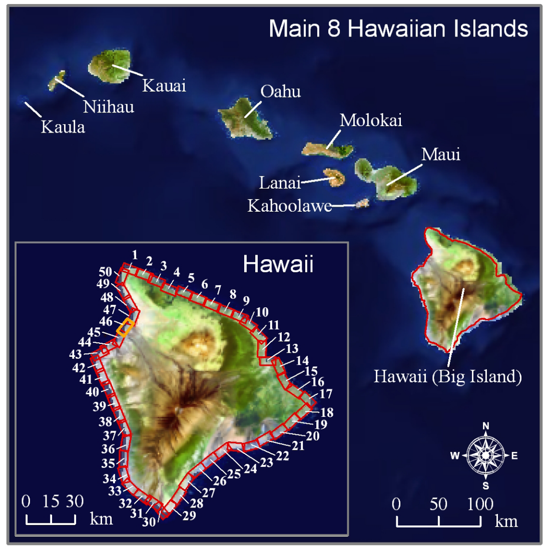
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 46)


155°54'30"W
19°57'30"N
Frame 45
19°54'N
Frame 47
155°51'W
19°54'N
155°51'W
19°57'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
S
W
E

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

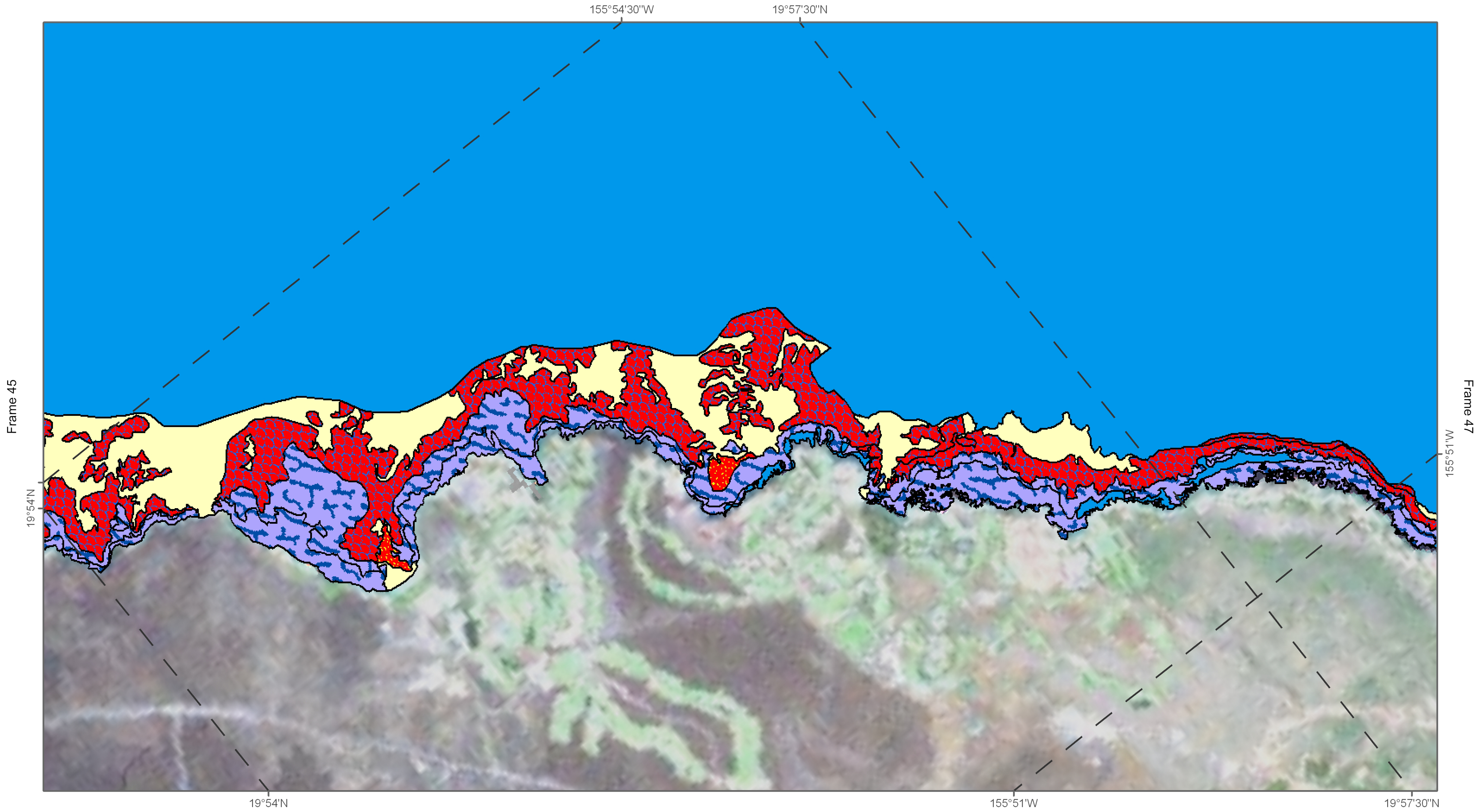
☐ Minimum Mapping Unit (1 Acre)

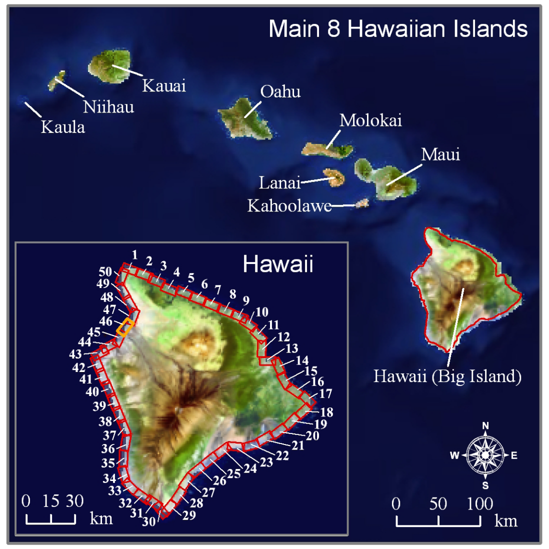
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 46)


155°54'30"W
19°57'30"N
Frame 45
19°54'N
Frame 47
155°51'W
19°54'N
155°51'W
19°57'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- ▦ Individual Patch Reef
- 🟥 Scattered Coral/Rock
- ▤ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

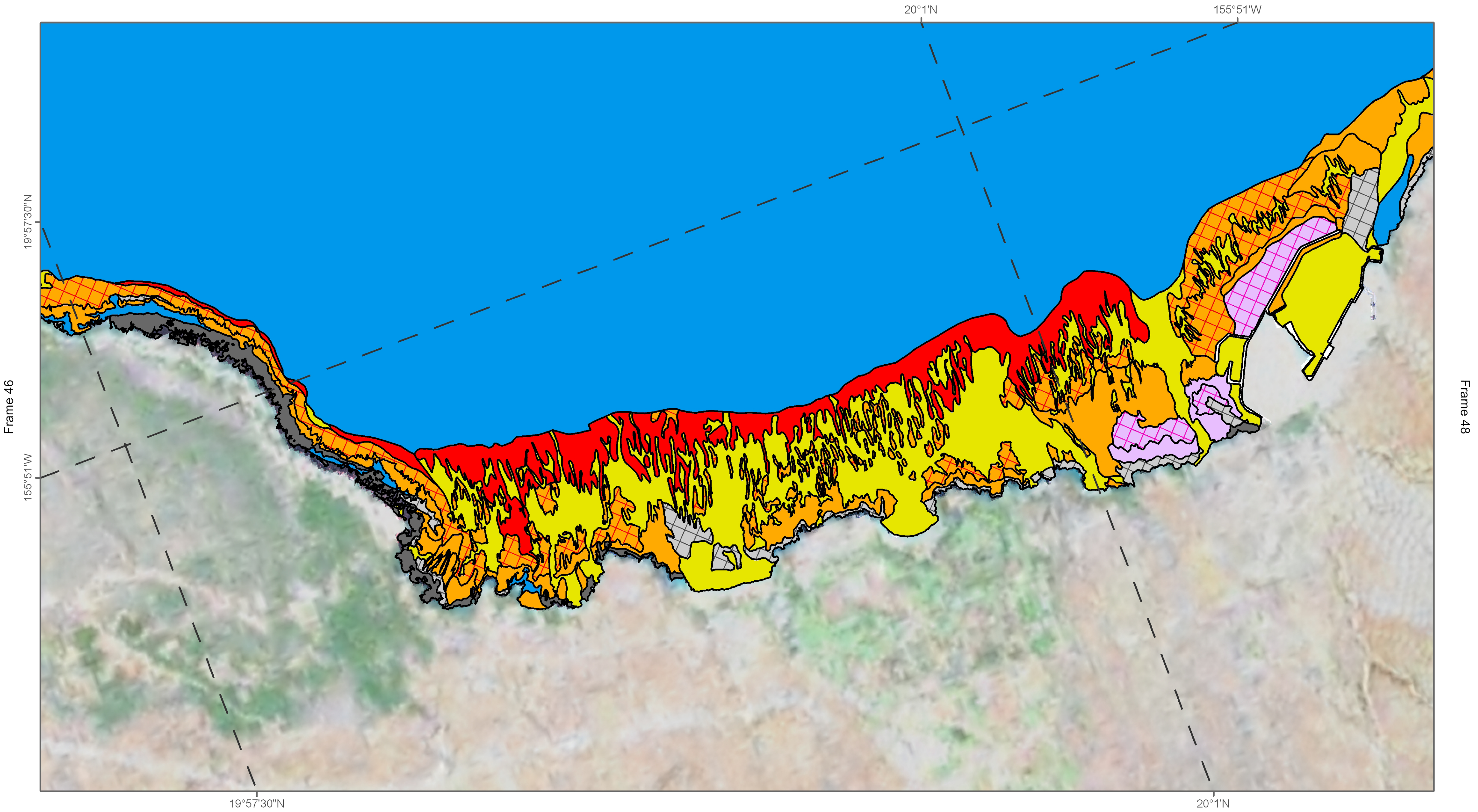
□ Minimum Mapping Unit (1 Acre)

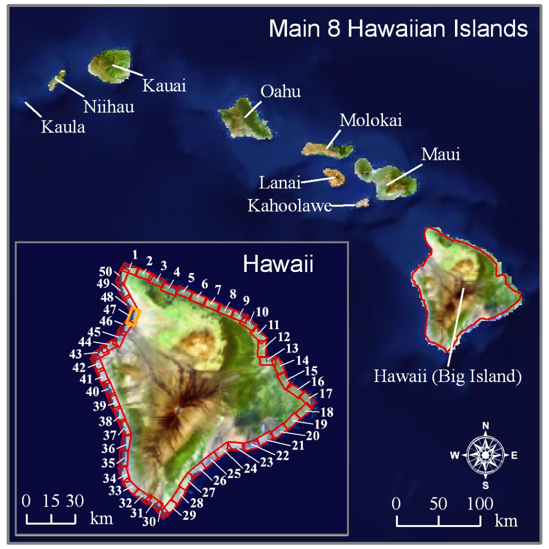
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 47)


20°1'N
155°51'W
19°57'30"N
Frame 46
155°51'W
Frame 48
19°57'30"N
20°1'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
Hawaii (Big Island)
N
W
E
S
0 50 100 km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ☐ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ☐ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ☐ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

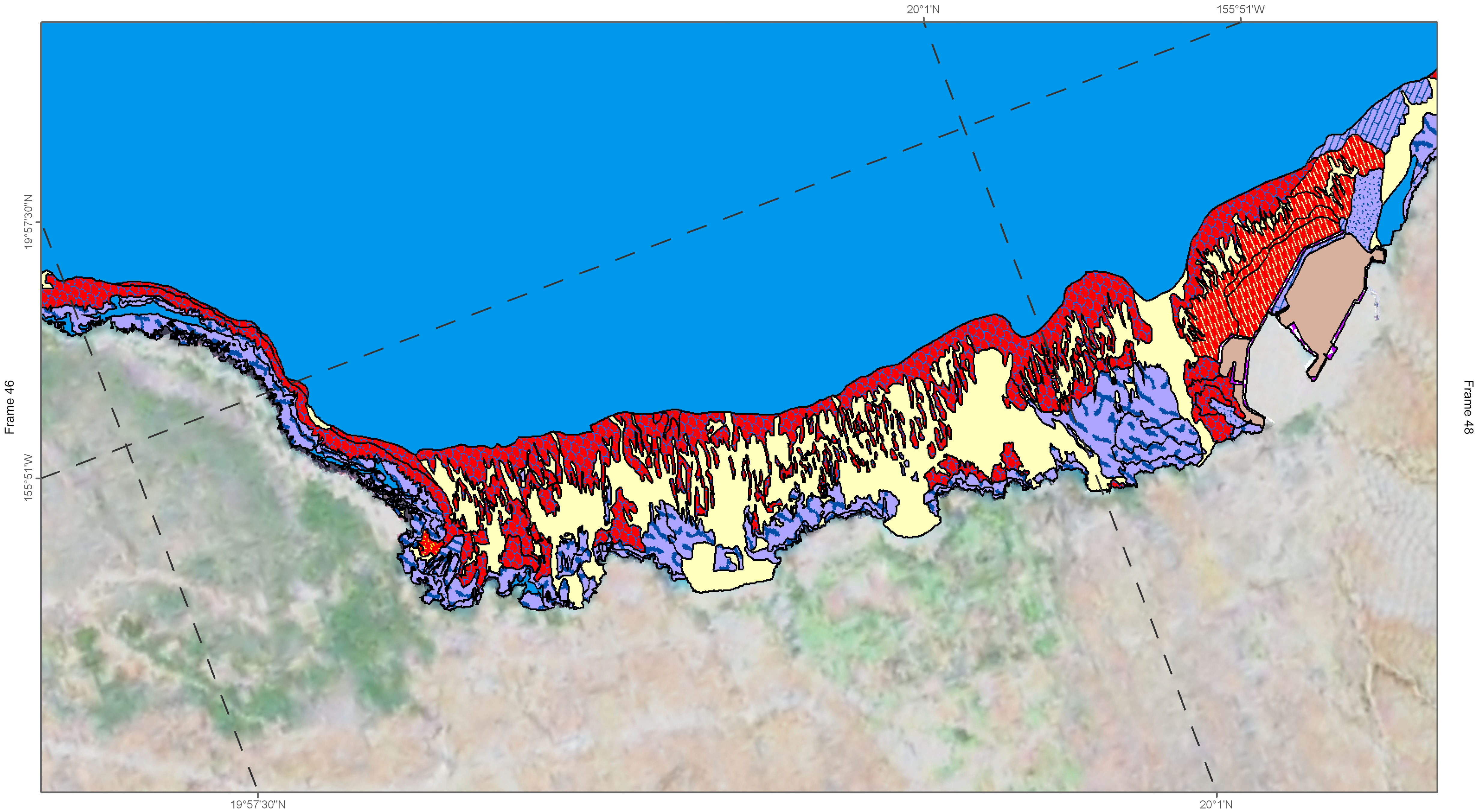
☐ Minimum Mapping Unit (1 Acre)

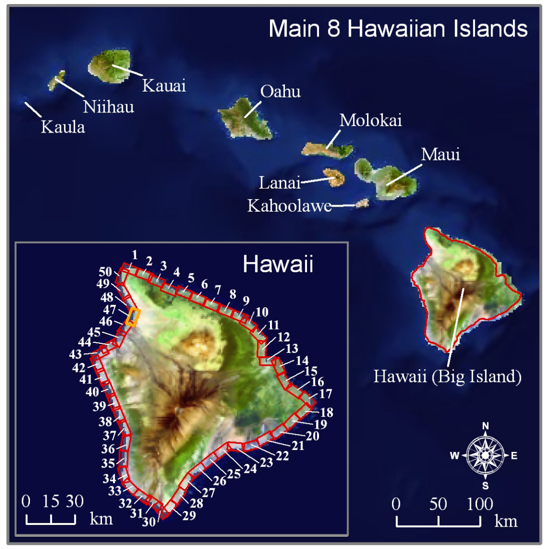
0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 47)


20°1'N
155°51'W
19°57'30"N
155°51'W
Frame 46
Frame 48
19°57'30"N
20°1'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
S
E
W

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

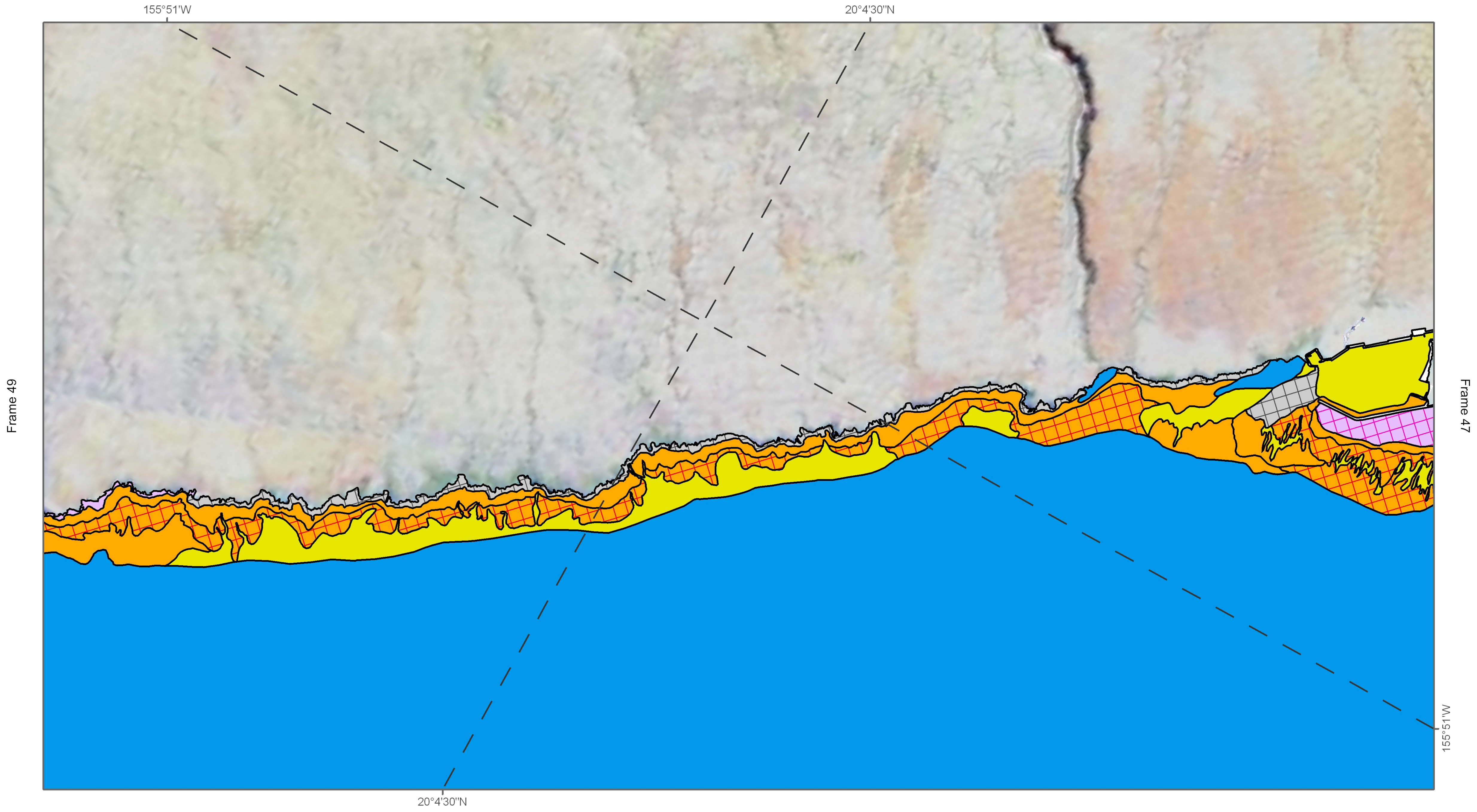
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

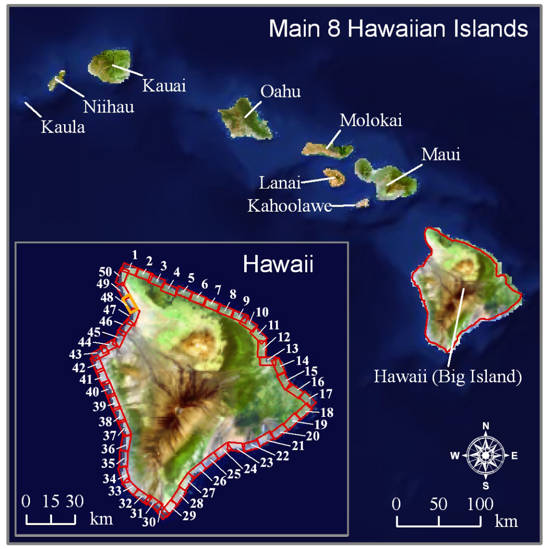
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 48)



155°51'W
20°4'30"N
Frame 49
Frame 47
155°51'W
20°4'30"N



Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
E
S
W

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

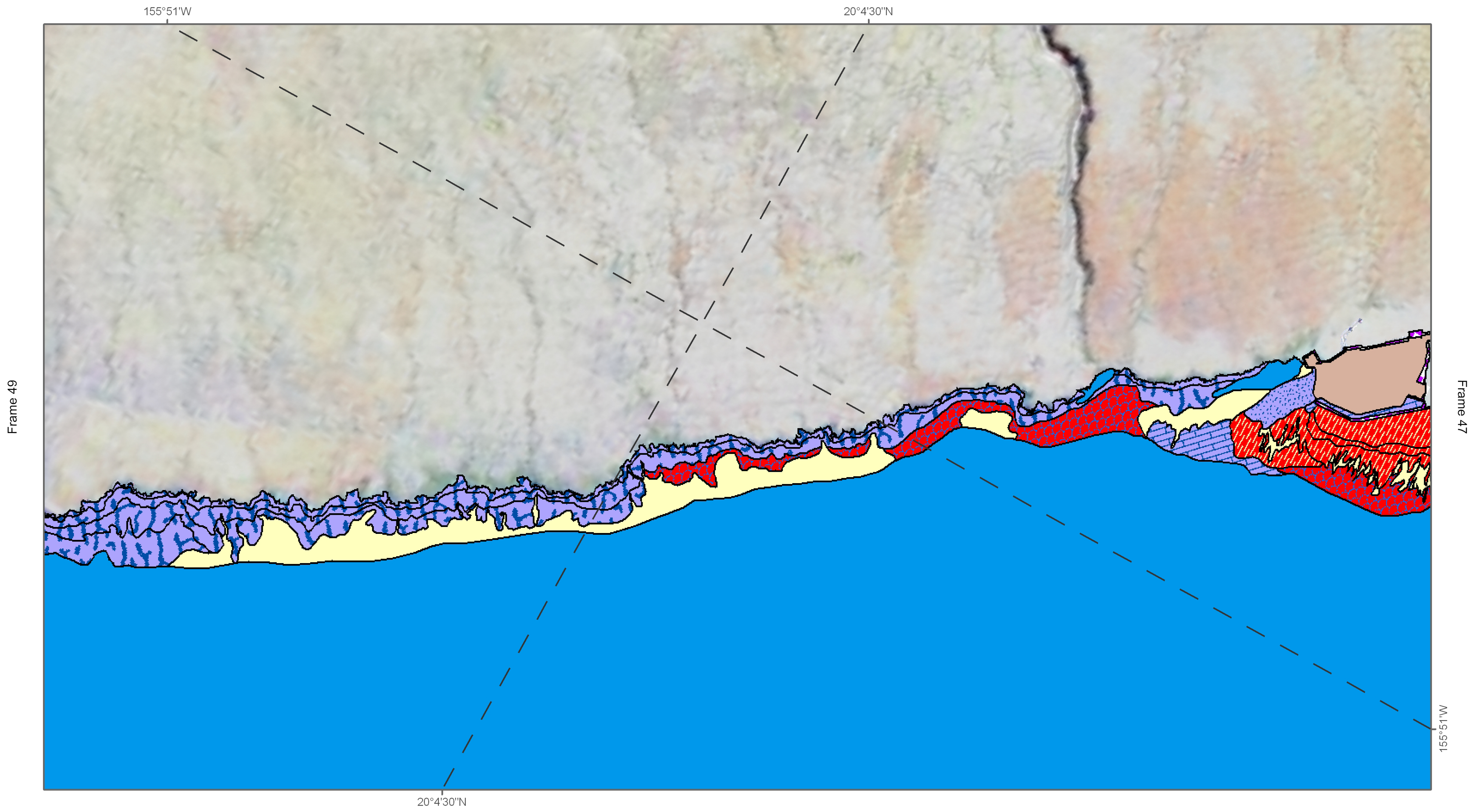
☐ Minimum Mapping Unit (1 Acre)

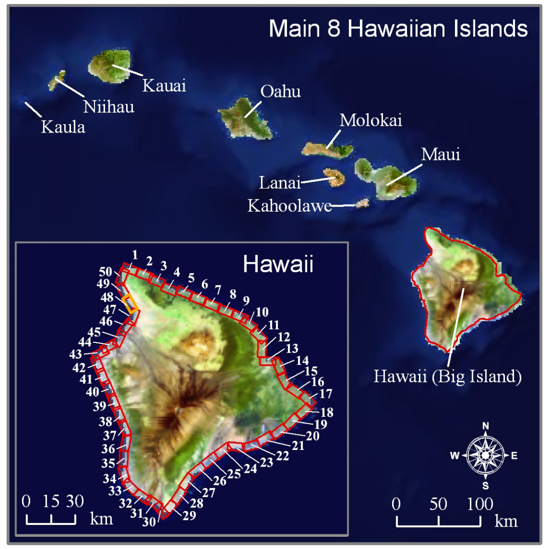
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 48)


155°51'W
20°4'30"N
Frame 49
Frame 47
155°51'W
20°4'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100
km
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30
km
N
E
S
W

Geomorphological Structure Types

- Aggregate Reef
- Aggregated Patch Reef
- Individual Patch Reef
- Scattered Coral/Rock
- Spur and Groove
- Pavement
- Pavement with Sand Channels
- Rock/Boulder
- Rubble
- Artificial
- Mud
- Sand
- Unknown

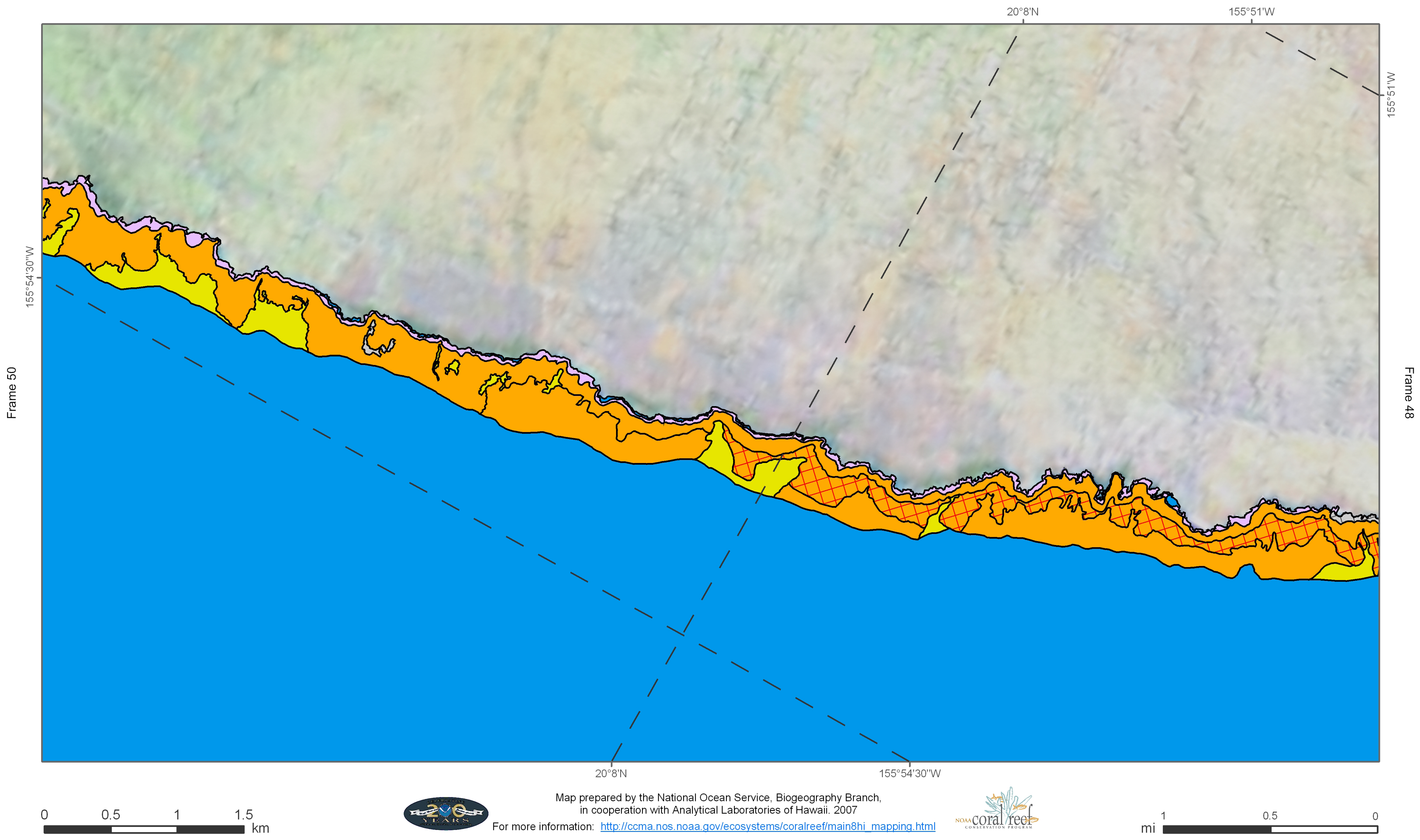
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

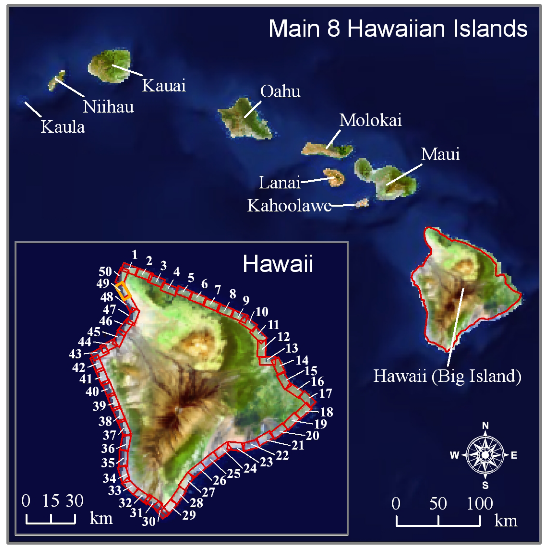
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 49)



20°8'N
155°51'W
155°51'W
155°54'30"W
Frame 50
Frame 48
20°8'N
155°54'30"W
0
0.5
1
1.5
km
mi
1
0.5
0



Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30
km
0 50 100
km
N
W
E
S

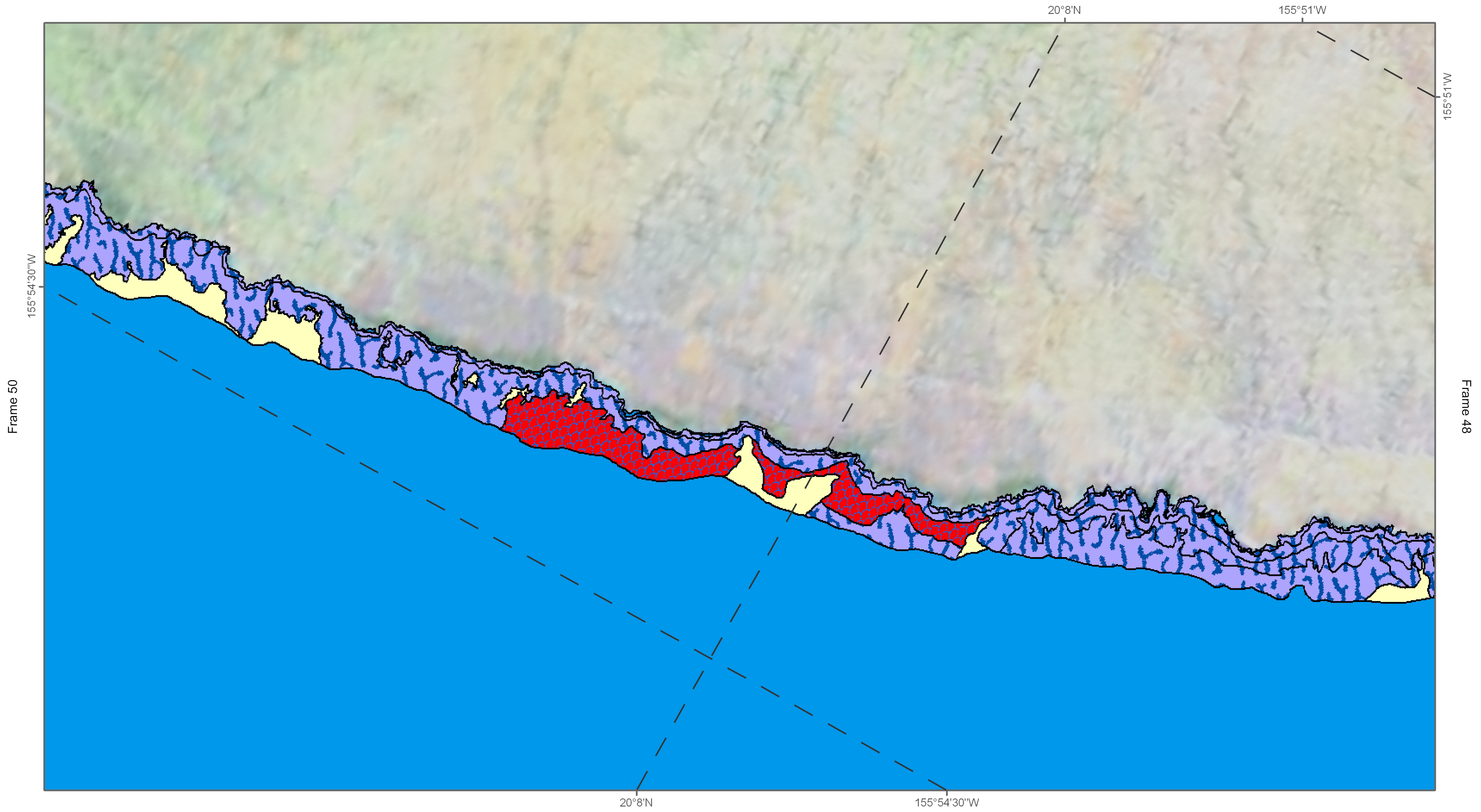
Biological Cover Types

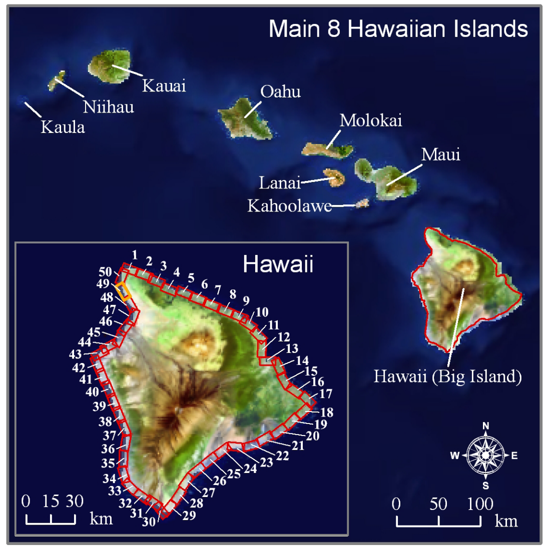
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 49)


20°8'N
155°51'W
155°51'W
155°54'30"W
Frame 50
Frame 48
20°8'N
155°54'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
0 15 30 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

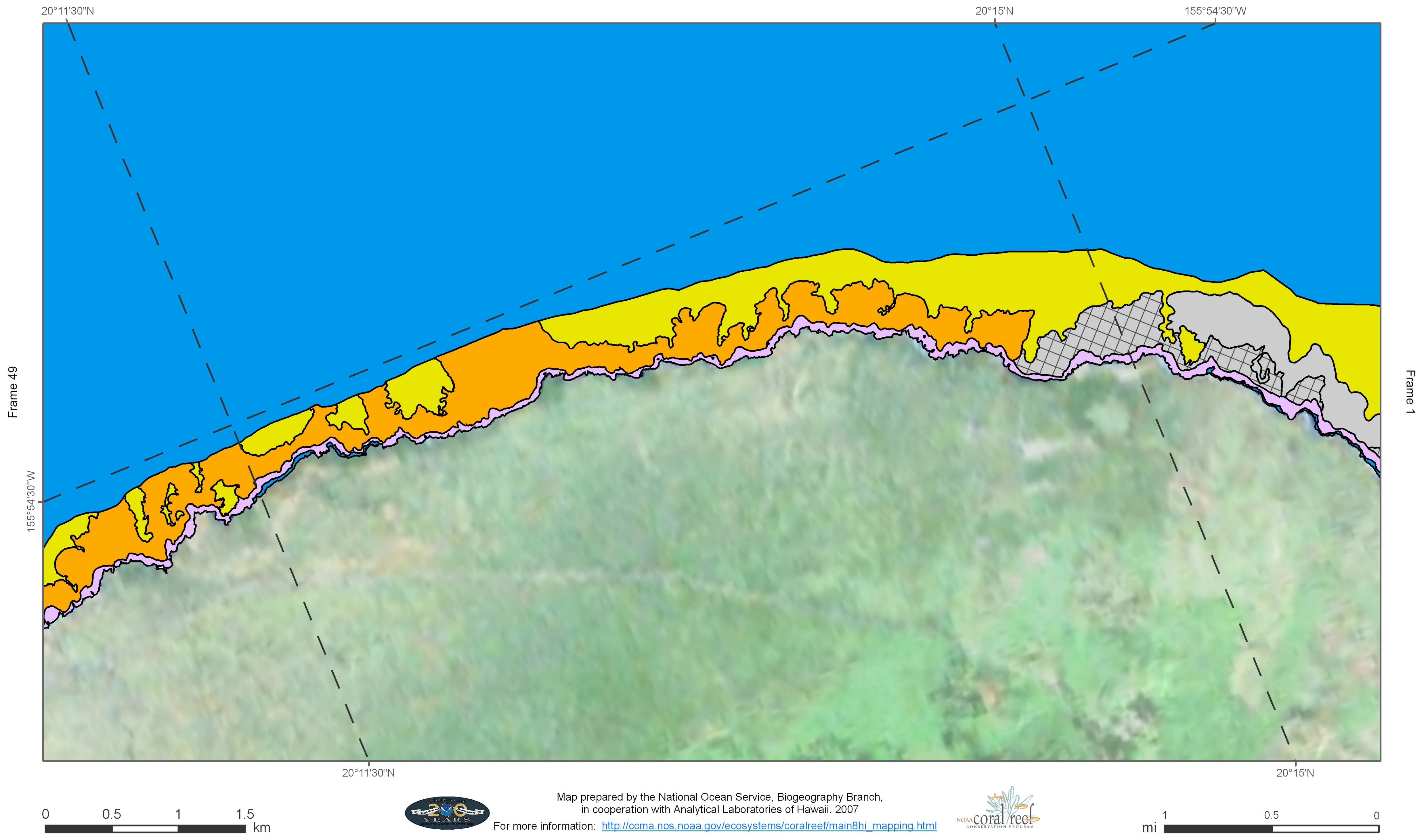
□ Minimum Mapping Unit (1 Acre)

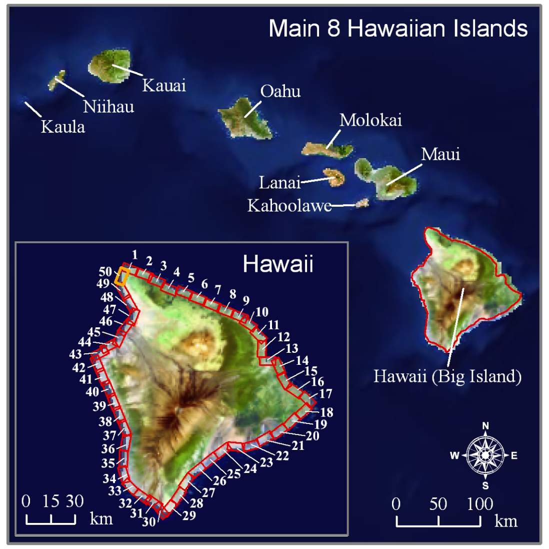
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 50)


20°11'30"N
20°15'N
155°54'30"W
Frame 49
155°54'30"W
Frame 1
20°11'30"N
20°15'N
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Oahu
Niihau
Kaula
Molokai
Maui
Lanai
Kahoolawe
Hawaii
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30 km
Hawaii (Big Island)
N
W
E
S
0 50 100 km

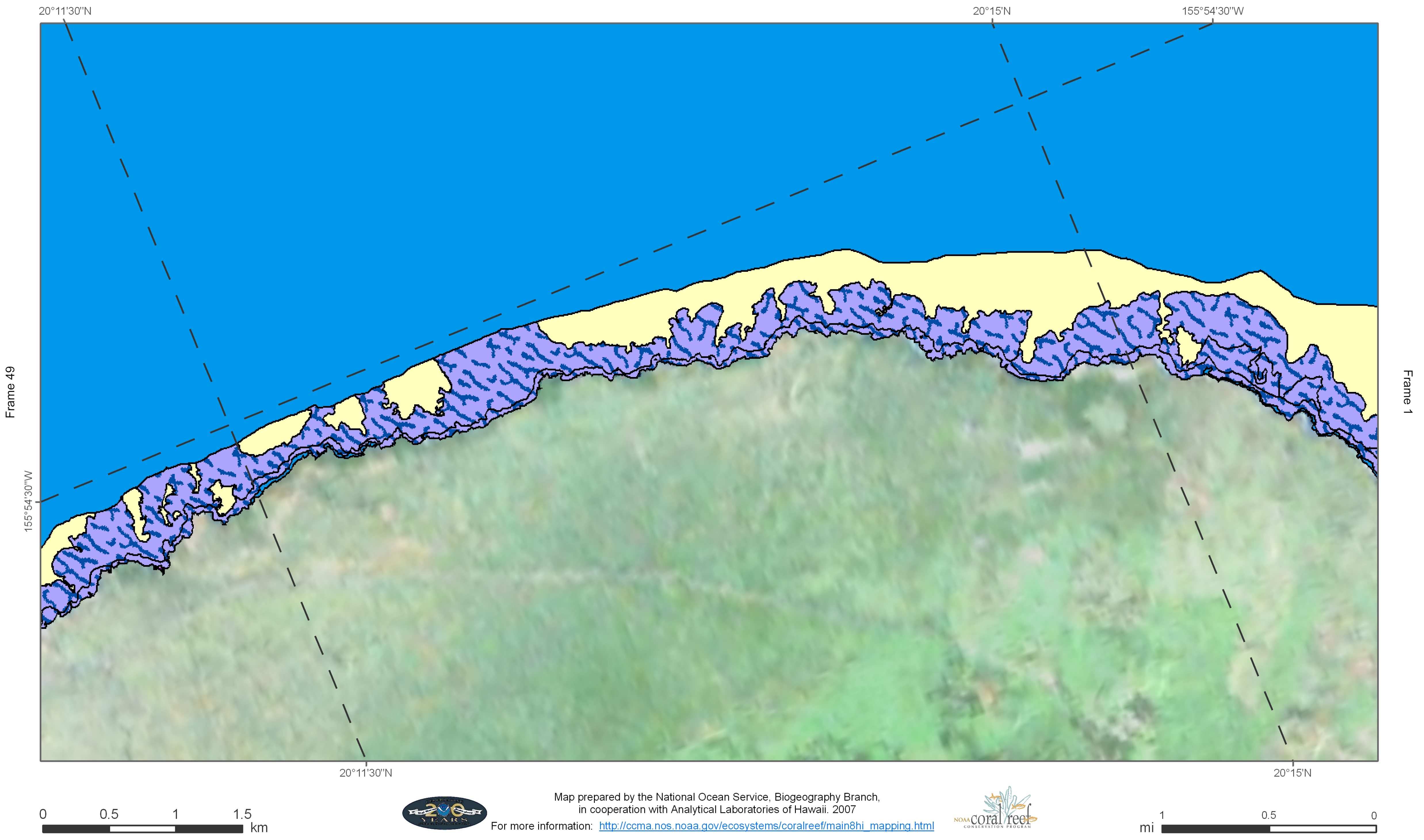
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

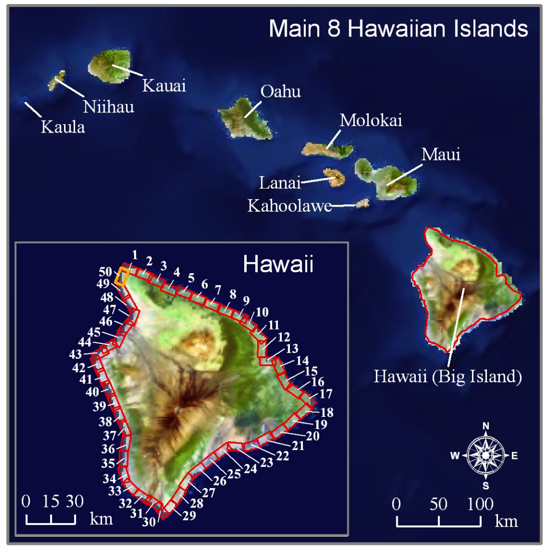
Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Main 8 Hawaiian Islands (Hawaii) : Shallow-water Benthic Habitats (Frame 50)


20°11'30"N
20°15'N
155°54'30"W
Frame 49
155°54'30"W
Frame 1
20°11'30"N
20°15'N
0 0.5 1 1.5
km
1 0.5 0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
Hawaii (Big Island)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
0 15 30
km
0 50 100
km
N
W
E
S

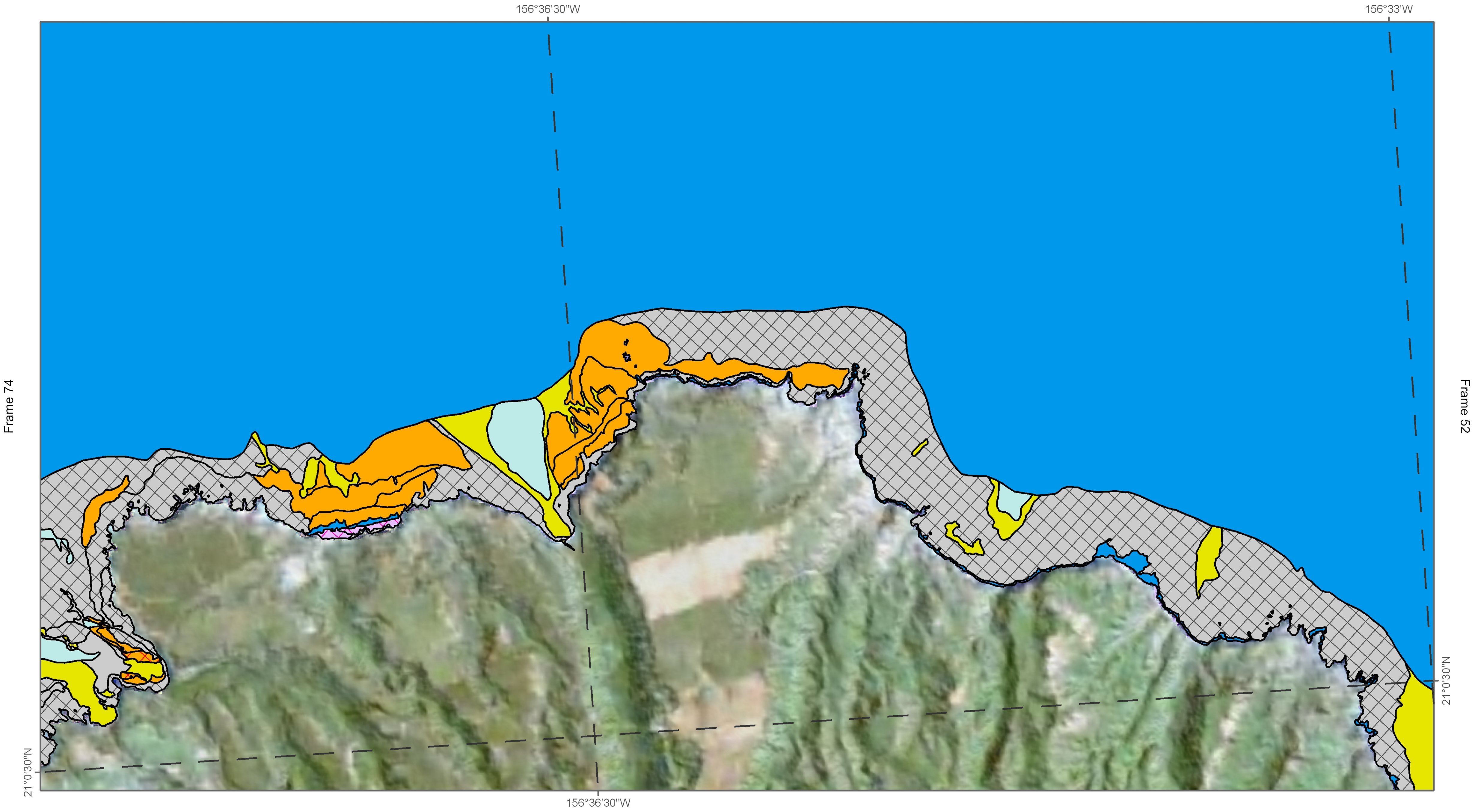
Geomorphological Structure Types

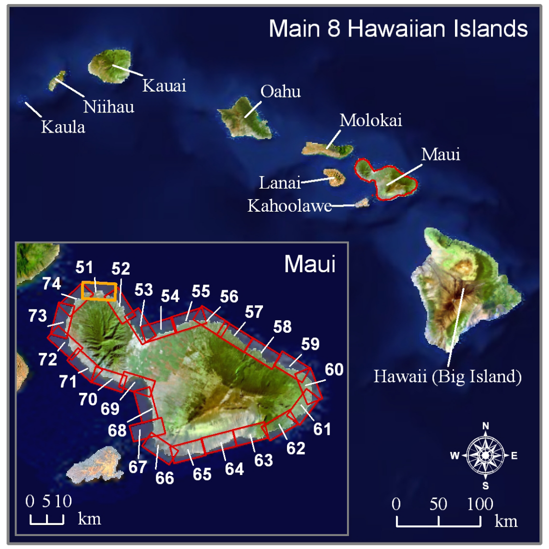
- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 51)


156°36'30"W
156°33'W
Frame 74
Frame 52
21°0'30"N
21°0'30"N
156°36'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
0 5 10
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

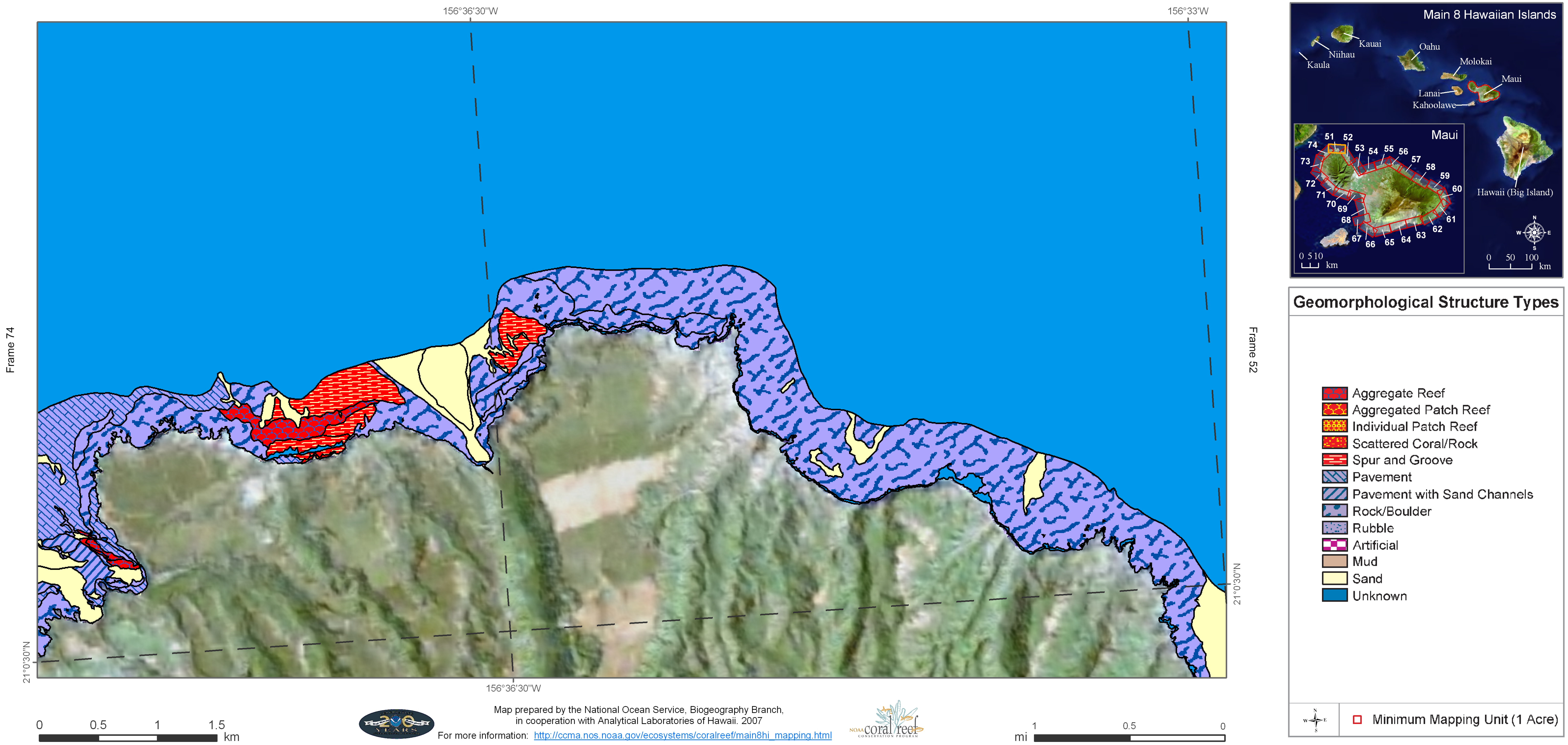
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

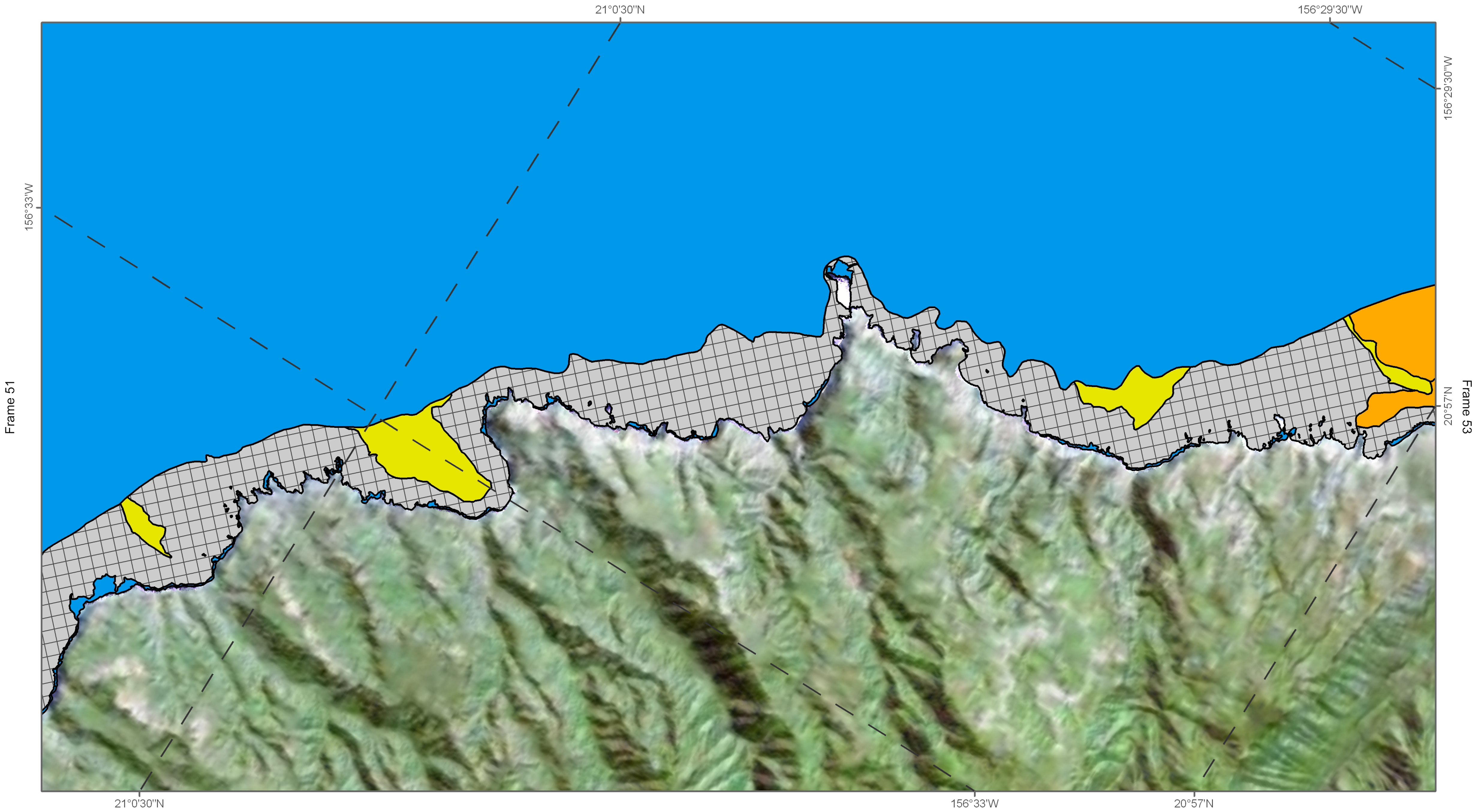
mi 1 0.5 0

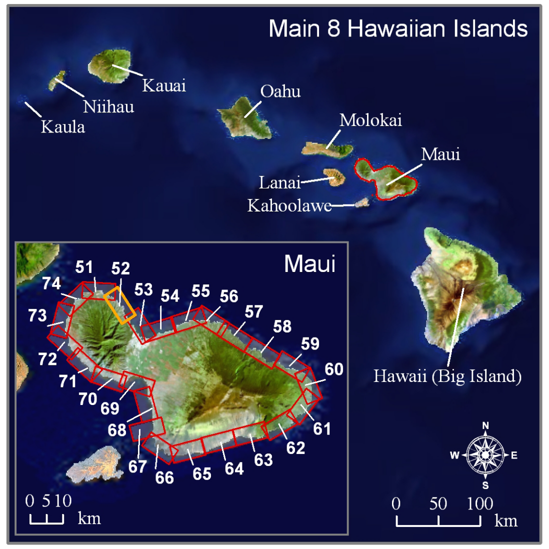
Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 51)


156°36'30"W
156°33'W
Frame 74
Frame 52
21°0'30"N
156°36'30"W
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10 km
0 50 100 km
N E S W
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)
0 0.5 1 1.5 km
mi 1 0.5 0

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 52)


21°0'30"N
156°29'30"W
156°29'30"W
156°33'W
Frame 51
20°57'N
Frame 53
21°0'30"N
156°33'W
20°57'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10 km
0 50 100 km
N S E W

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

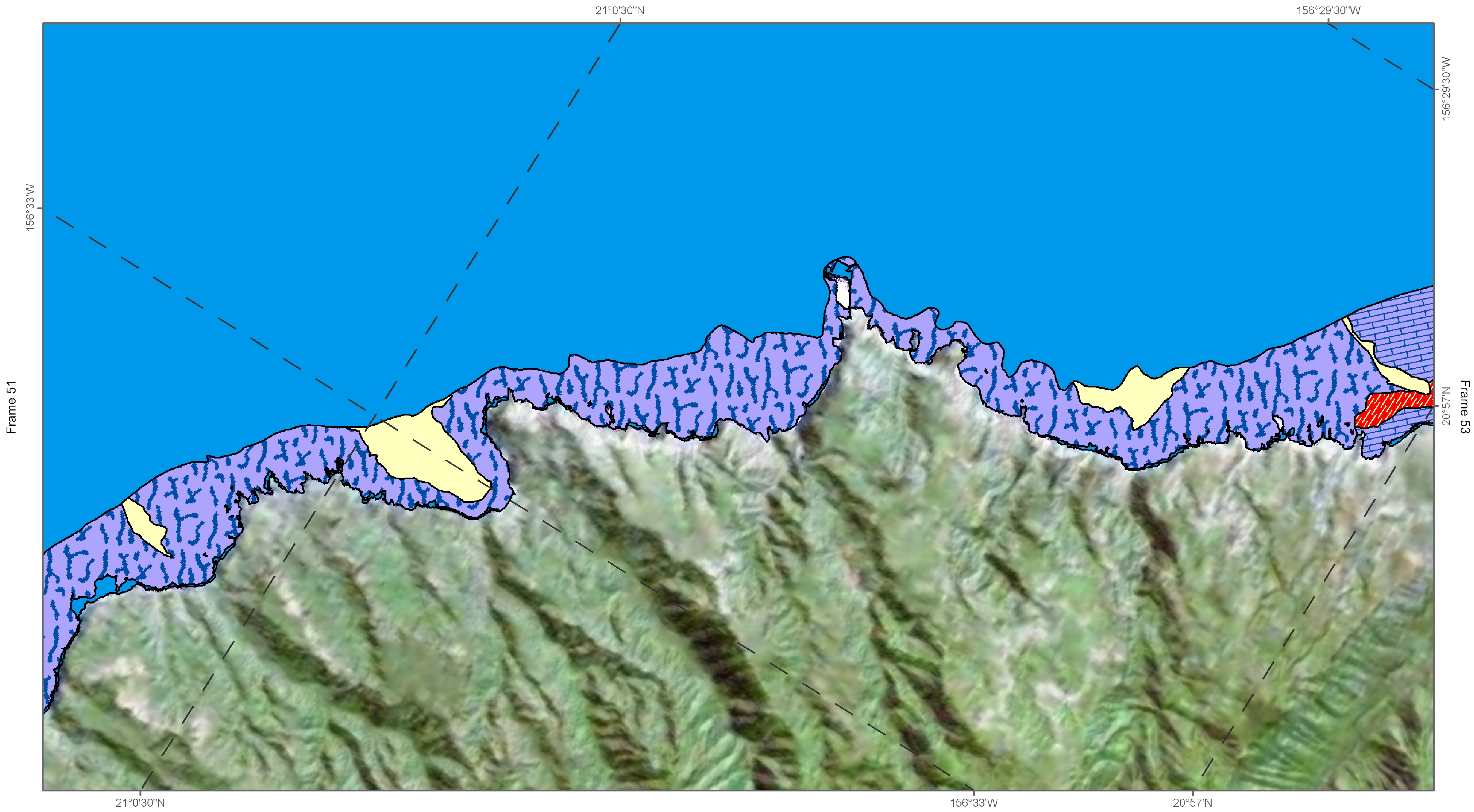
□ Minimum Mapping Unit (1 Acre)

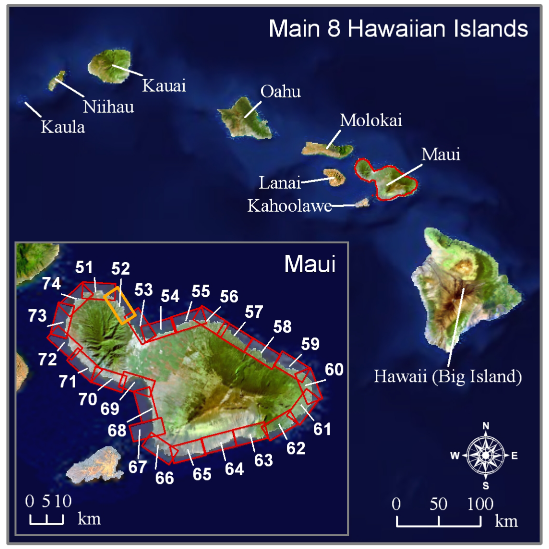
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 52)


21°0'30"N
156°29'30"W
156°29'30"W
156°33'W
Frame 51
20°57'N
Frame 53
21°0'30"N
156°33'W
20°57'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Maui
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
Hawaii (Big Island)
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

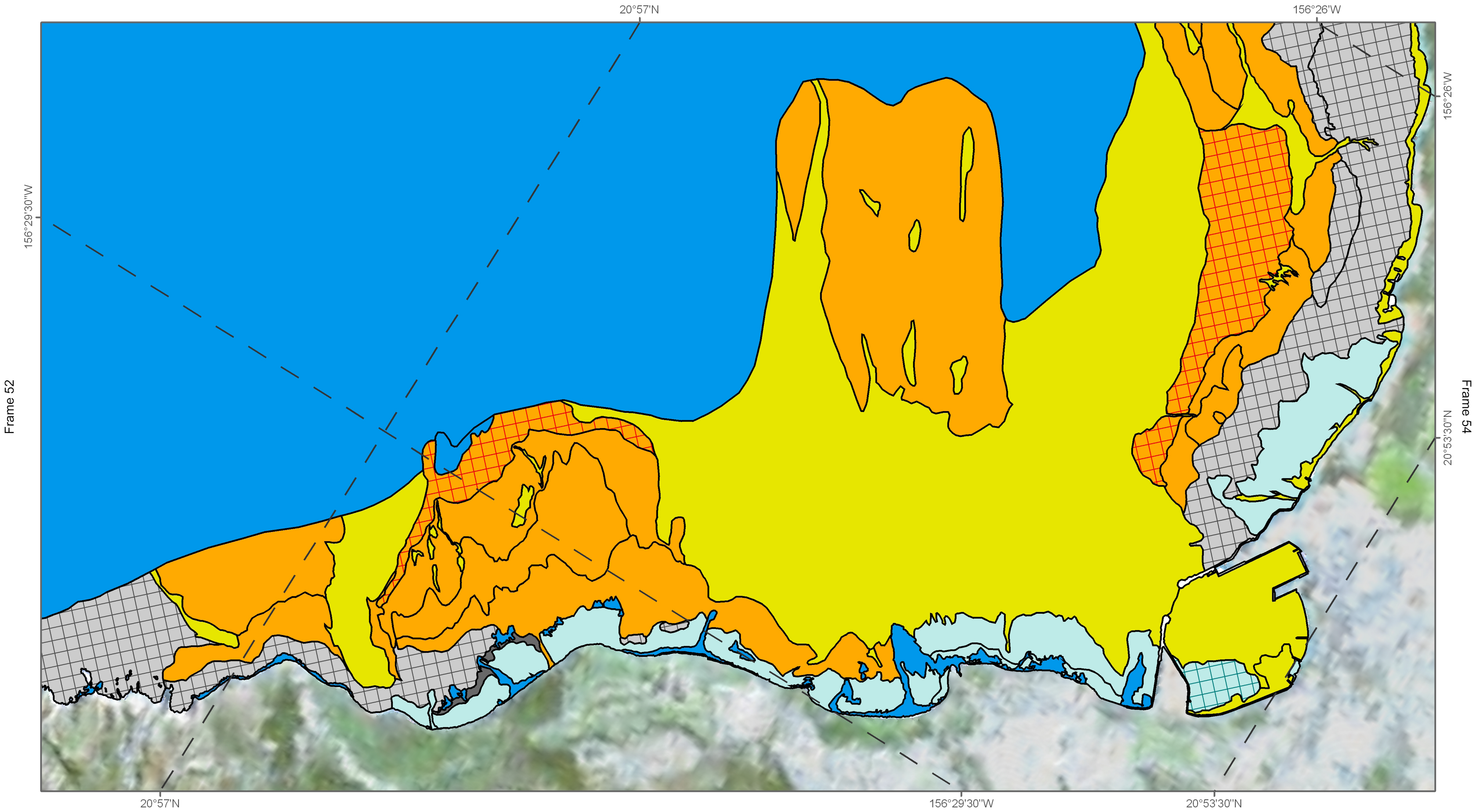
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

1 0.5 0
mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 53)


20°57'N
156°26'W
156°26'W
156°29'30"W
Frame 52
Frame 54
20°53'30"N
20°57'N
156°29'30"W
20°53'30"N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Maui
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
Hawaii (Big Island)
0 5 10
km
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

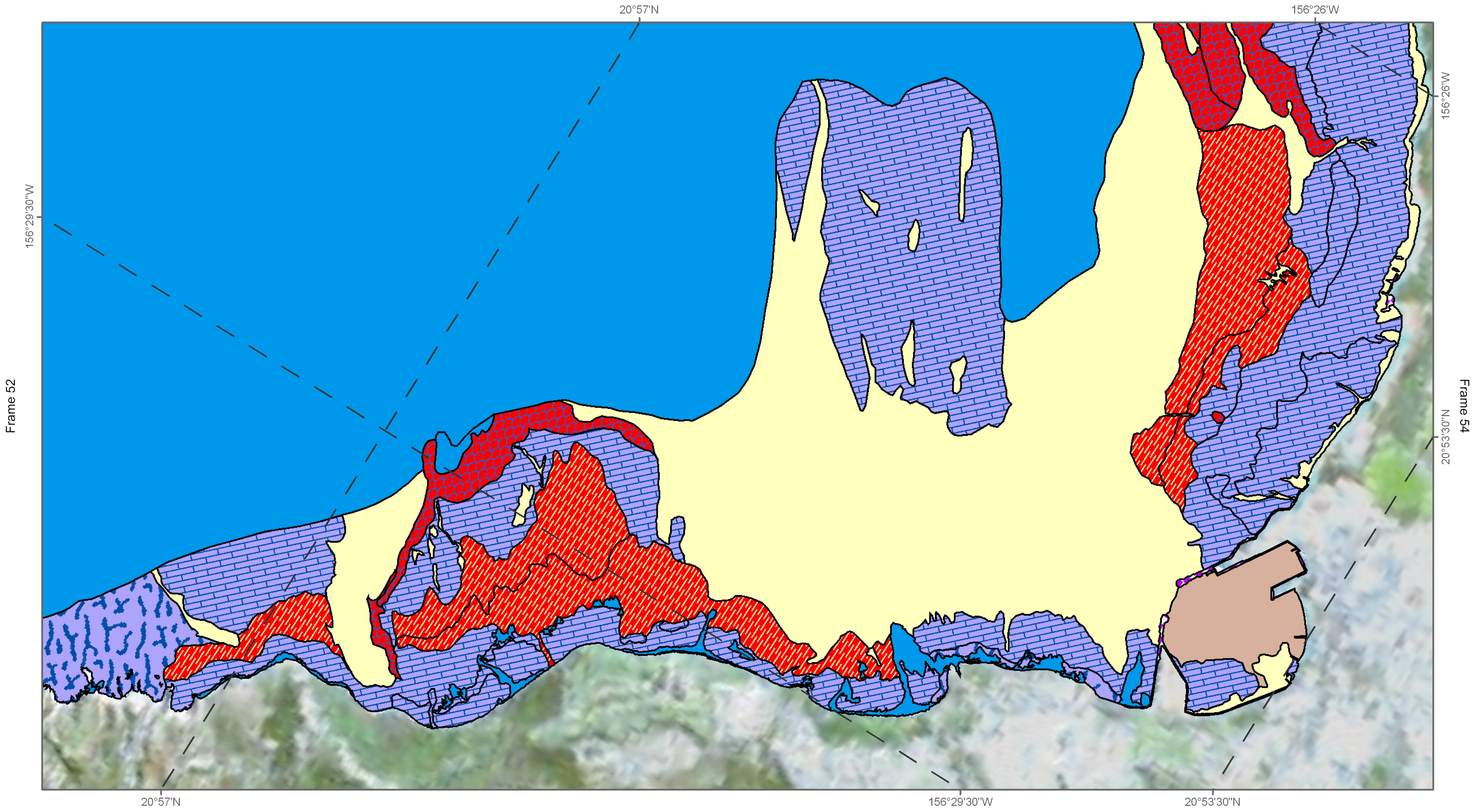
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 53)


20°57'N
156°26'W
156°29'30"W
156°26'W
Frame 52
Frame 54
20°53'30"N
20°57'N
156°29'30"W
20°53'30"N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Maui
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
0 5 10
km
Hawaii (Big Island)
N
W
E
S
0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

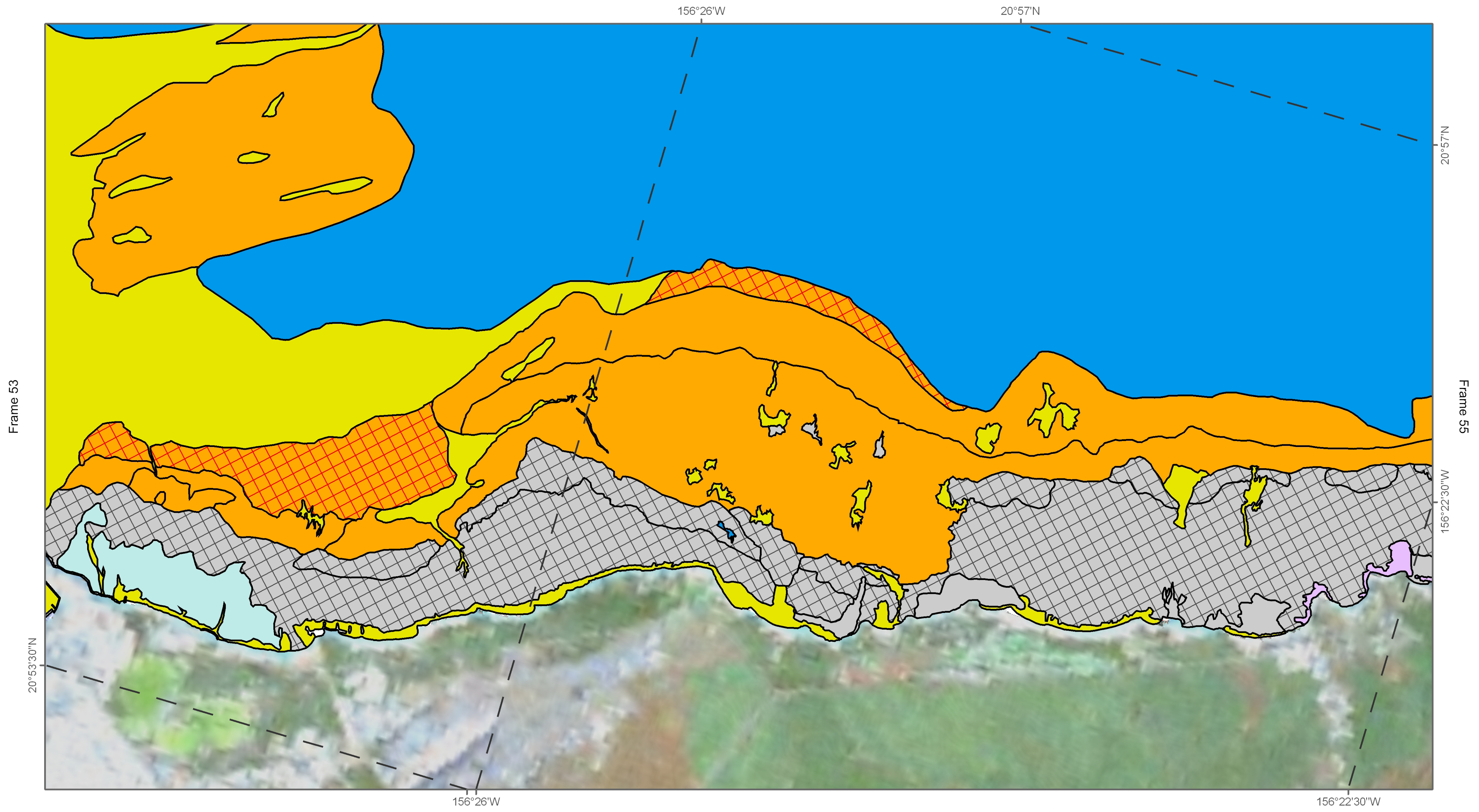
□ Minimum Mapping Unit (1 Acre)

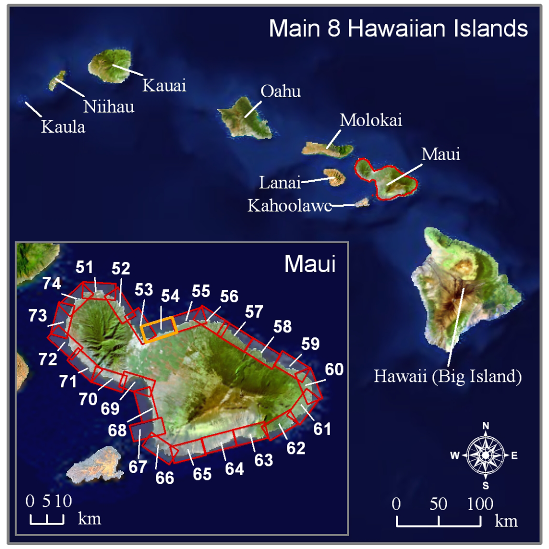
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 54)


156°26'W
20°57'N
20°57'N
Frame 53
Frame 55
156°22'30"W
20°53'30"N
156°26'W
156°22'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▢ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▢ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▢ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

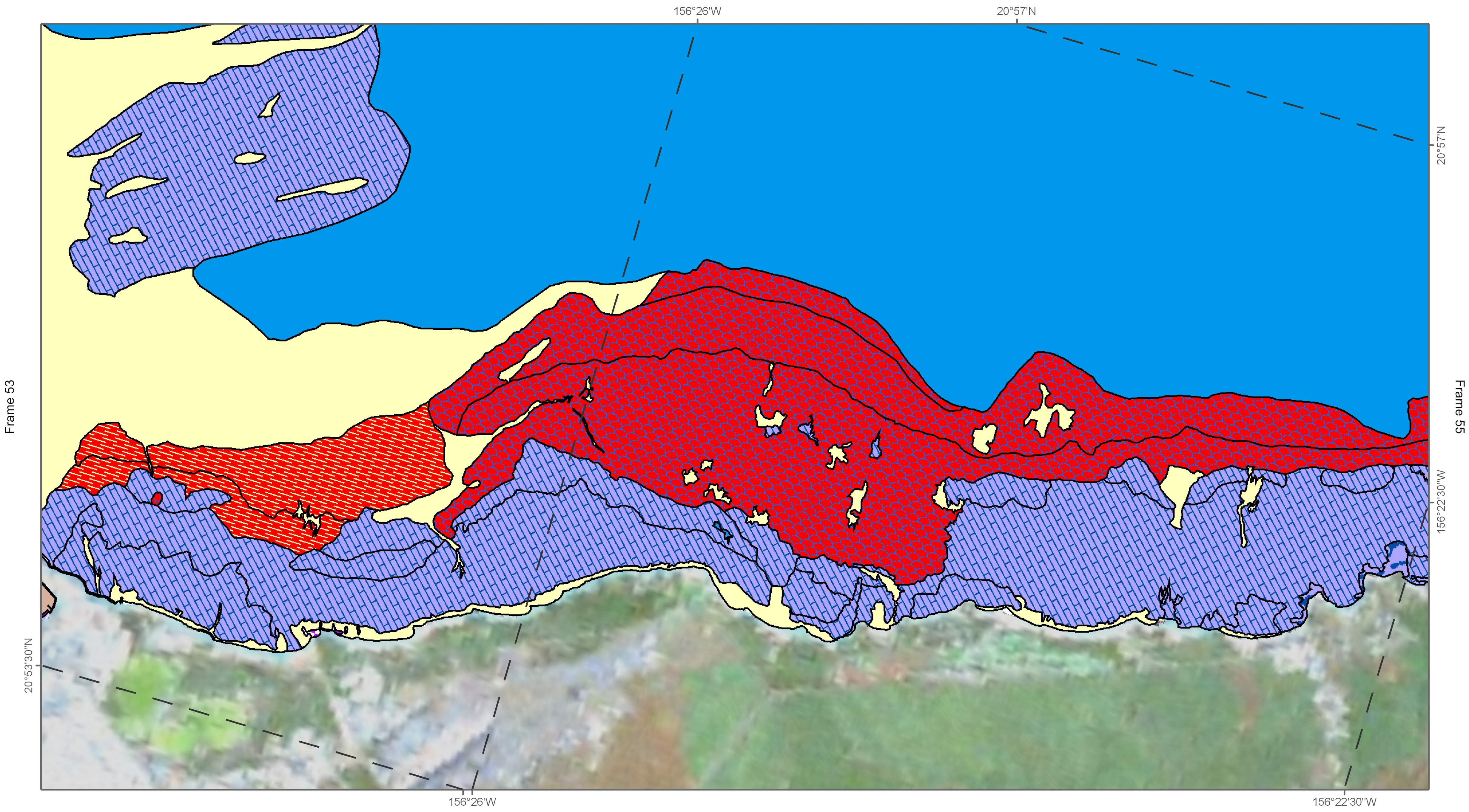
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 54)


156°26'W
20°57'N
20°57'N
Frame 53
Frame 55
156°22'30"W
20°53'30"N
156°26'W
156°22'30"W
0
0.5
1
1.5
km
1
0.5
0
mi

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
0 5 10
km
0 50 100
km
N
E
S
W

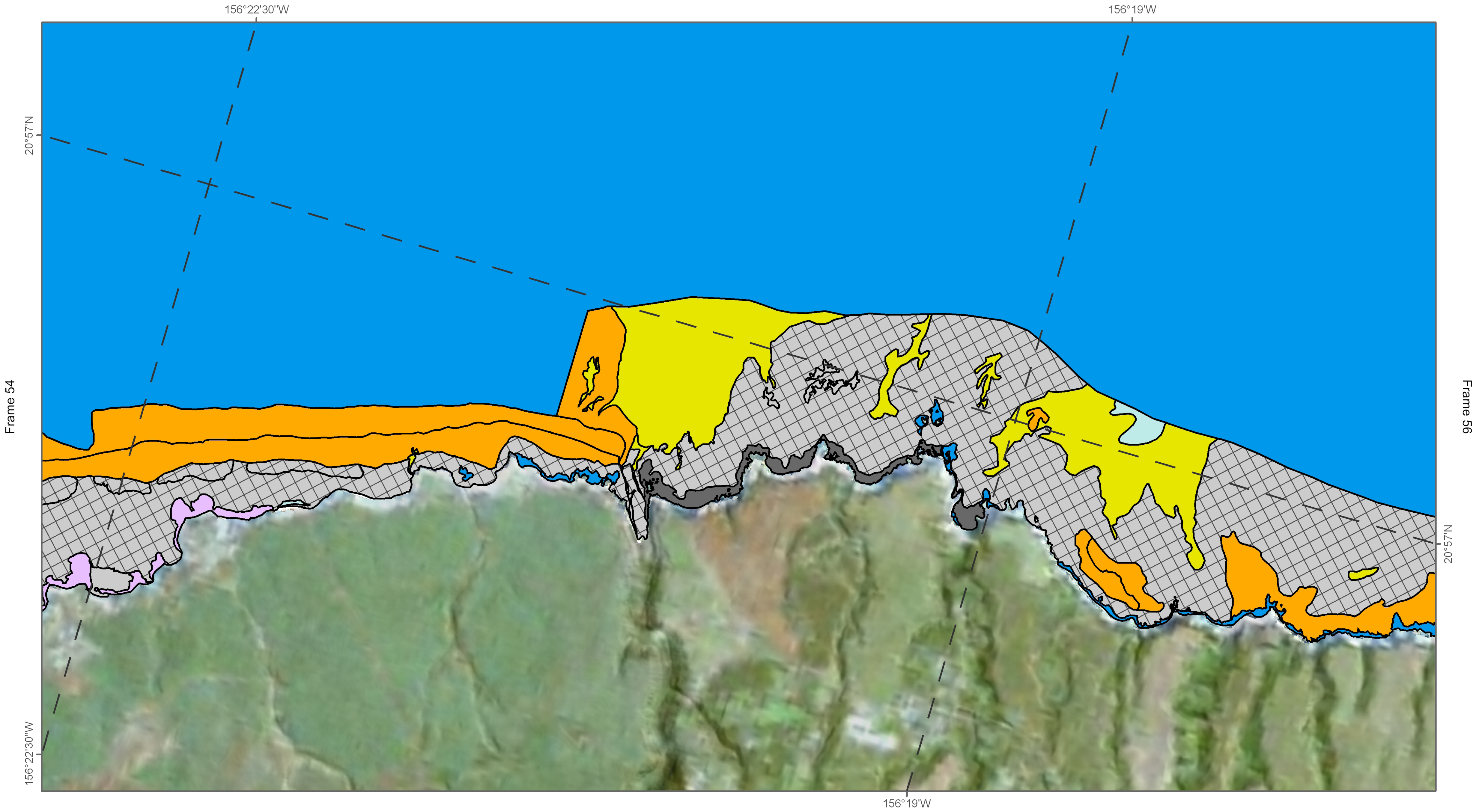
Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 55)


156°22'30"W
156°19'W
20°57'N
Frame 54
Frame 56
20°57'N
156°22'30"W
156°19'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Maui
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
0 5 10
km
Hawaii (Big Island)
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

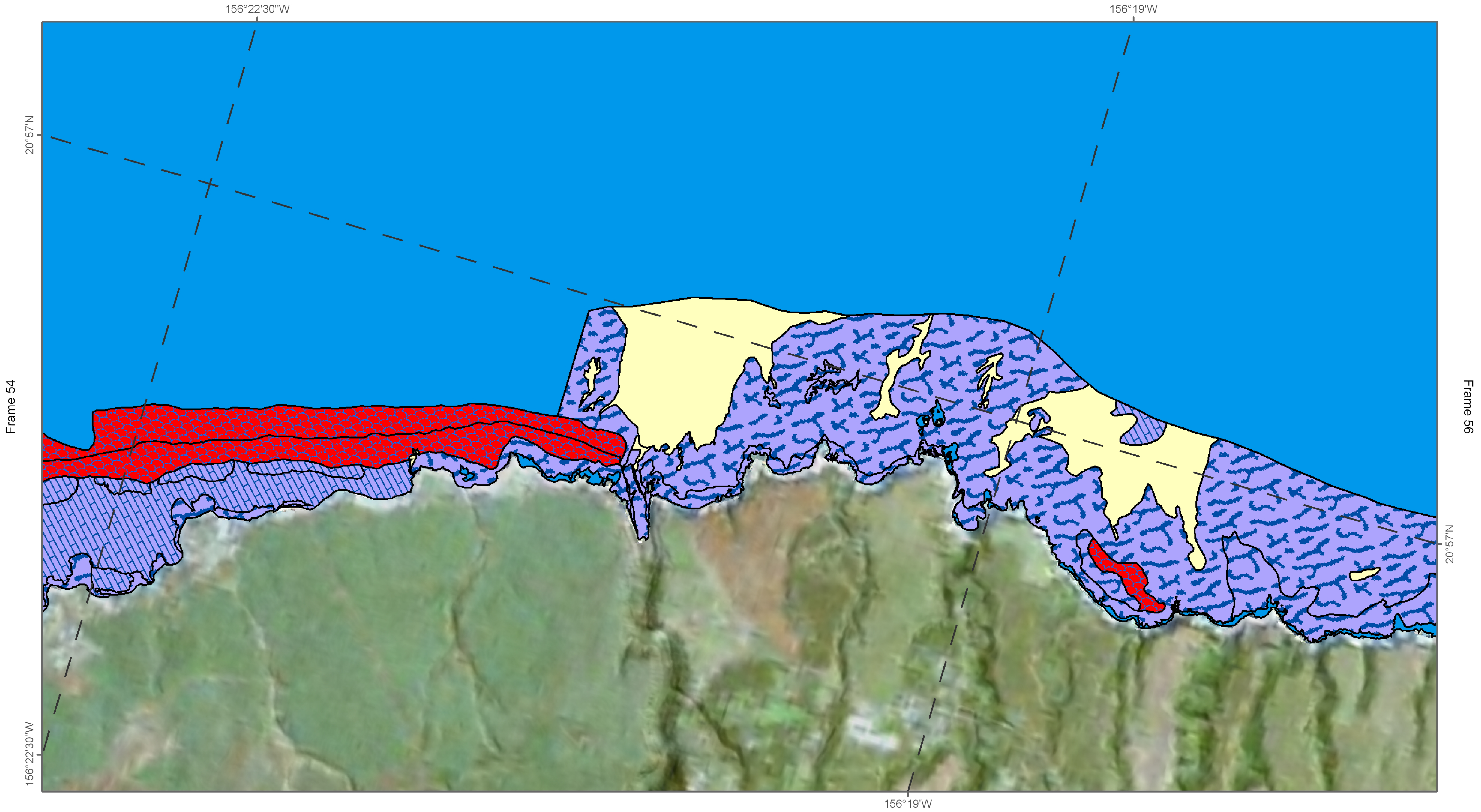
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 55)


156°22'30"W
156°19'W
20°57'N
Frame 54
Frame 56
20°57'N
156°22'30"W
156°19'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51
52
53
54
55
56
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70
71
72
73
74
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

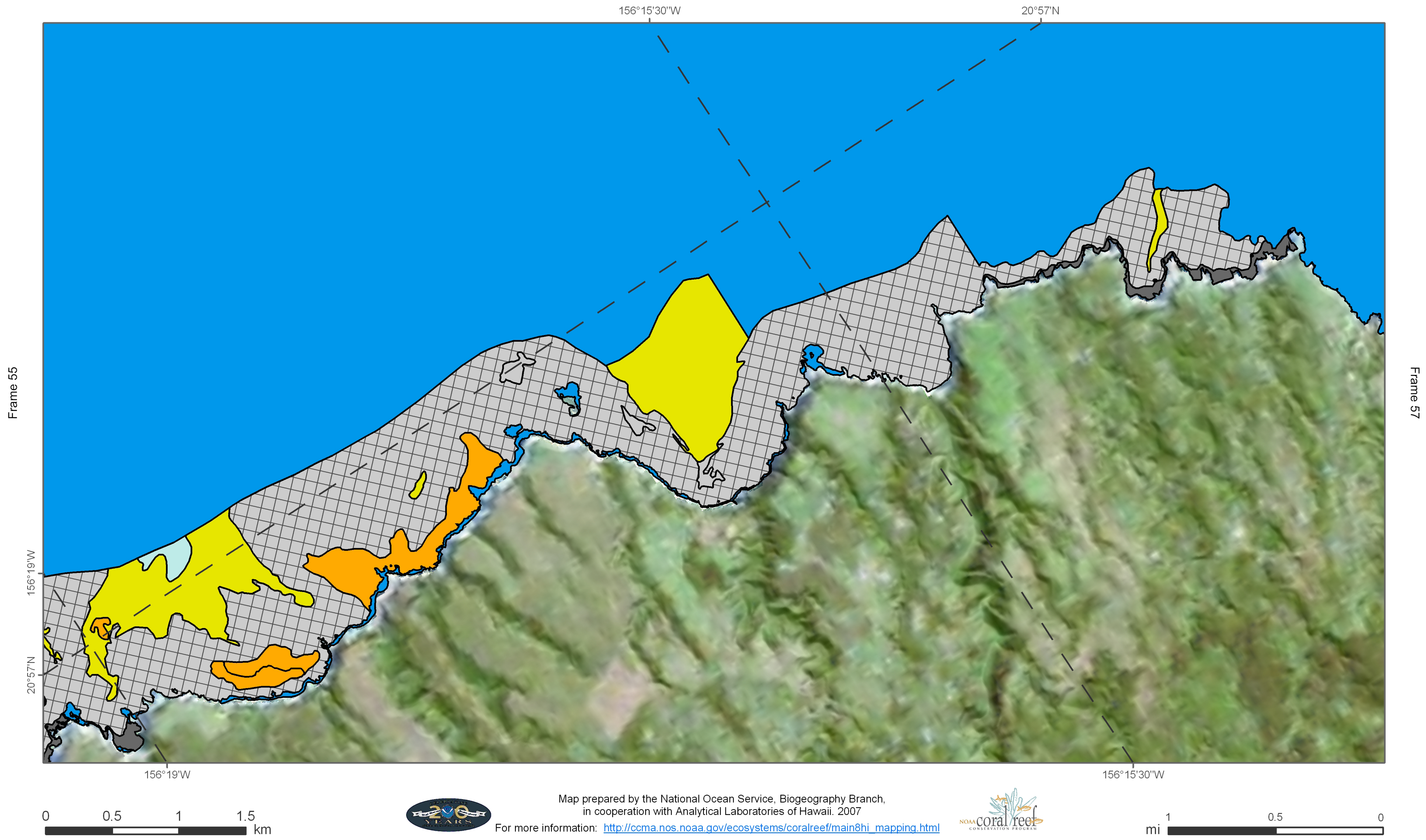
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 56)


156°15'30"W
20°57'N
Frame 55
Frame 57
156°19'W
20°57'N
156°19'W
156°15'30"W
0
0.5
1
1.5
km
1
0.5
0
mi

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51
52
53
54
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71
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73
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0 5 10
km
0
50
100
km
N
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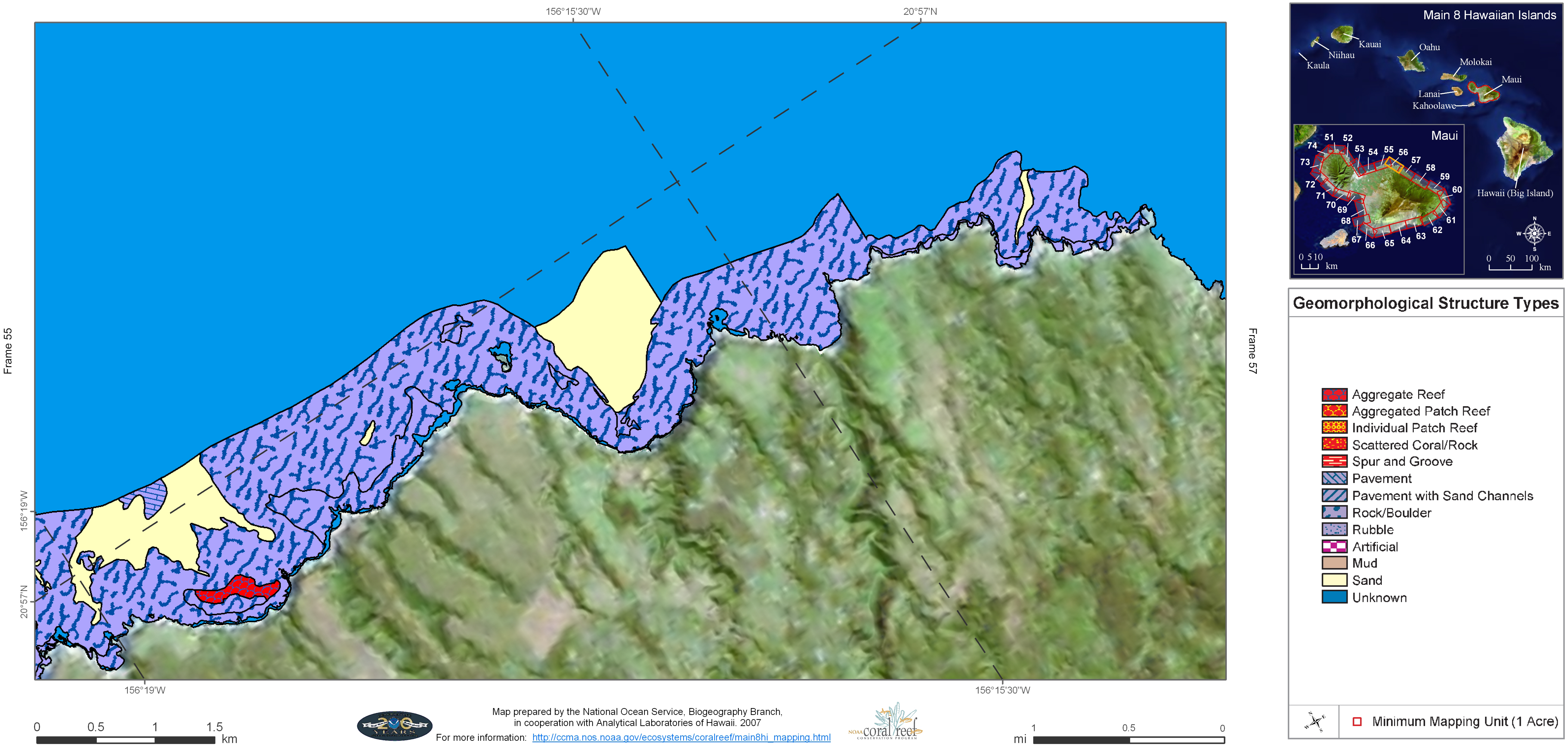
Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 56)


156°15'30"W
20°57'N
Frame 55
156°19'W
20°57'N
Frame 57
156°19'W
156°15'30"W
0
0.5
1
1.5
km
mi
1
0.5
0
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51
52
53
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62
63
64
65
66
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68
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70
71
72
73
74
0 5 10
km
0 50 100
km
N
S
E
W

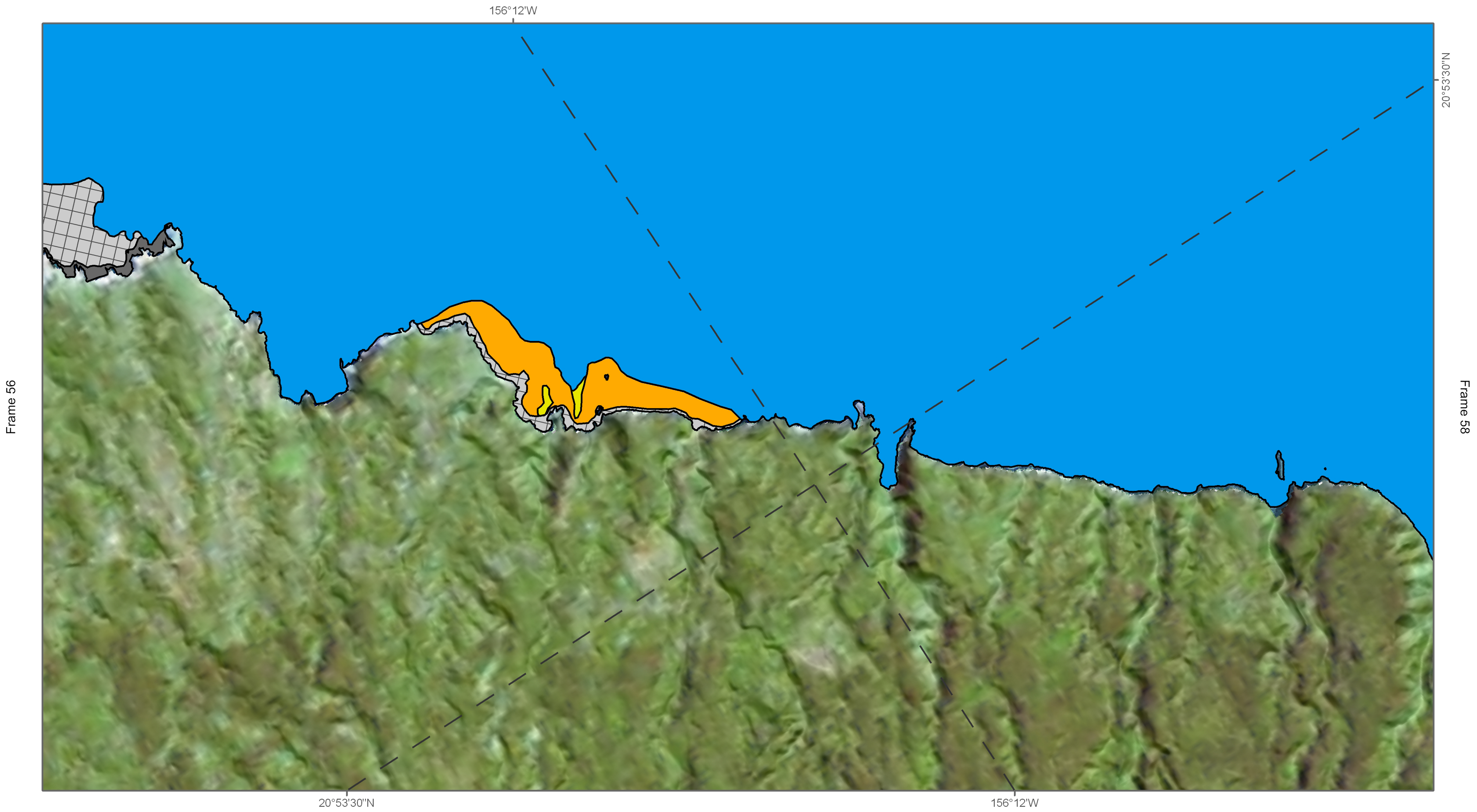
Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 57)


156°12'W
20°53'30"N
Frame 56
Frame 58
20°53'30"N
156°12'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Maui
51
52
53
54
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56
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58
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71
72
73
74
Hawaii (Big Island)
0 5 10
km
0 50 100
km
N
W
E
S

Biological Cover Types

- Coral 10%-<50%
- Coral 50%-<90%
- Coral 90%-100%
- Seagrass 10%-<50%
- Macroalgae 10%-<50%
- Macroalgae 50%-<90%
- Macroalgae 90%-100%
- Coralline Algae 10%-<50%
- Coralline Algae 50%-<90%
- Turf 10%-<50%
- Turf 50%-<90%
- Turf 90%-100%
- Emergent Vegetation 10%-<50%
- Emergent Vegetation 50%-<90%
- Emergent Vegetation 90%-100%
- Uncolonized 50%-<90%
- Uncolonized 90%-100%
- Unclassified
- Unknown

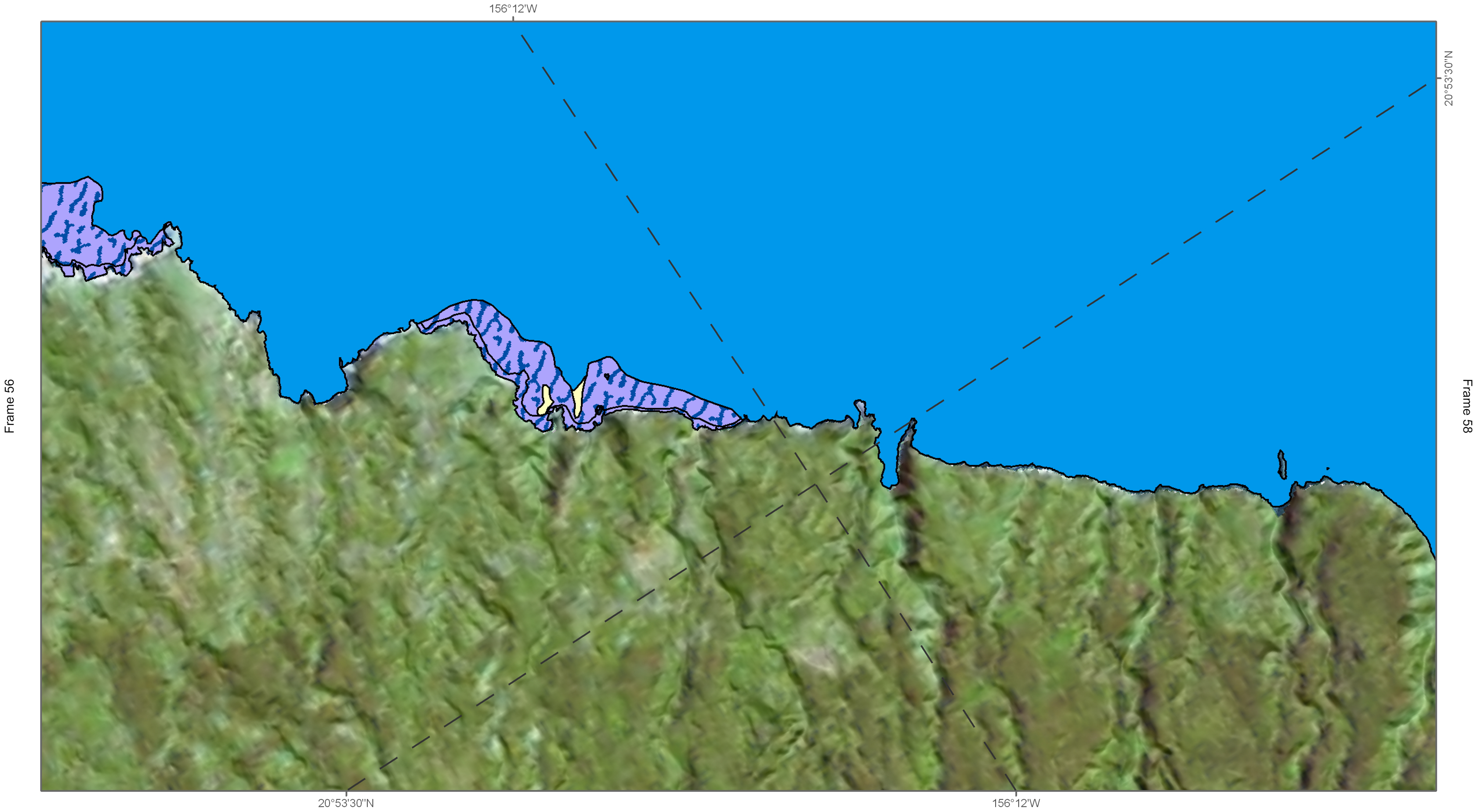
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 57)


156°12'W
20°53'30"N
Frame 56
Frame 58
20°53'30"N
156°12'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10 km
0 50 100 km
N E S W

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

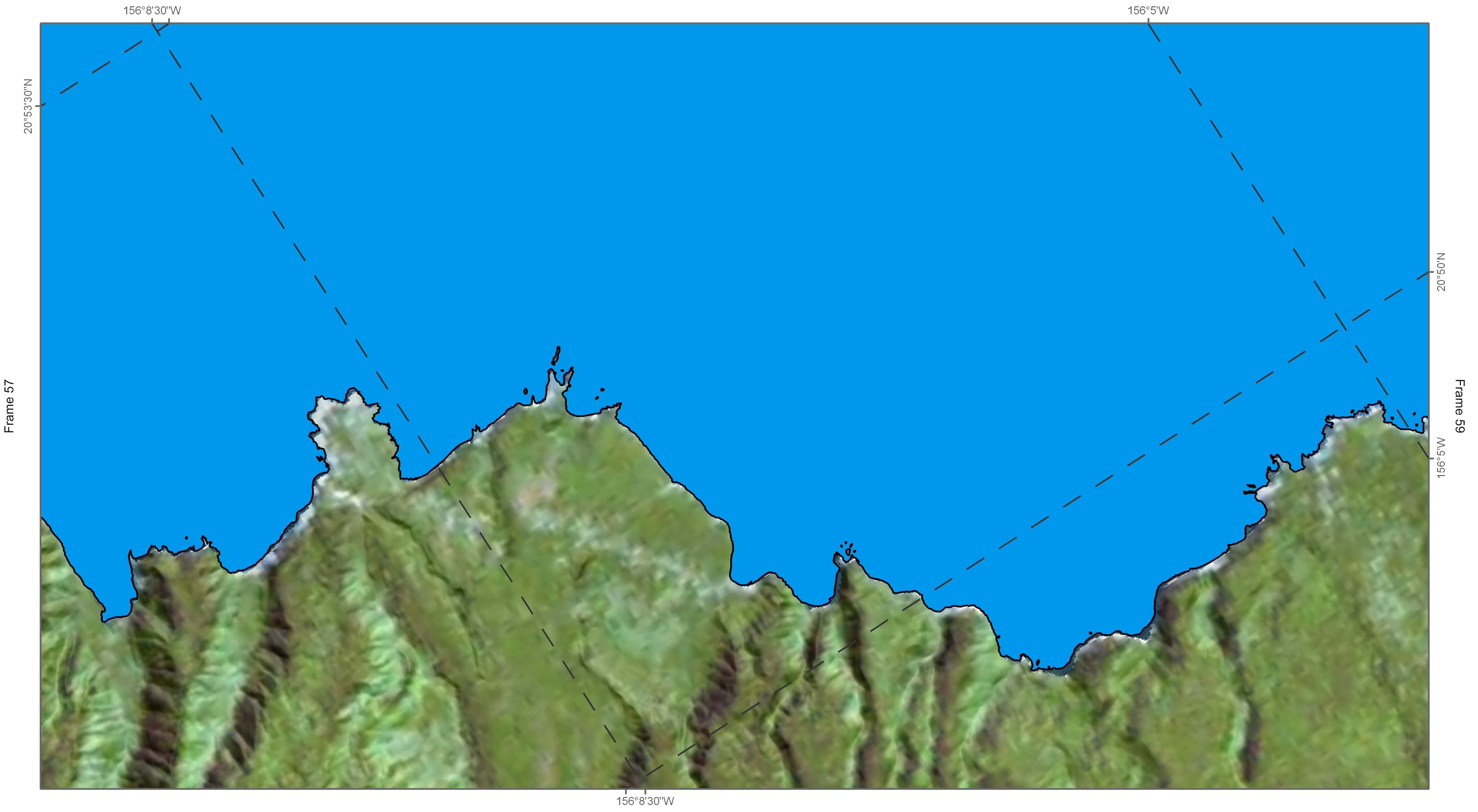
☐ Minimum Mapping Unit (1 Acre)

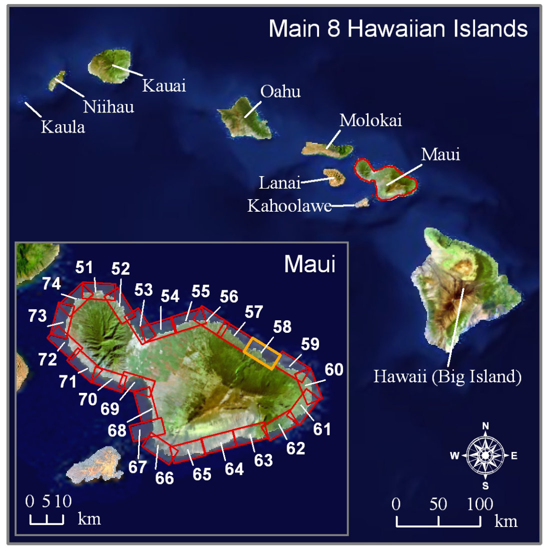
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 58)


156°8'30"W
156°5'W
20°53'30"N
20°50'N
Frame 57
Frame 59
156°5'W
156°8'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
Hawaii (Big Island)
N
W
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S
0 5 10
km
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

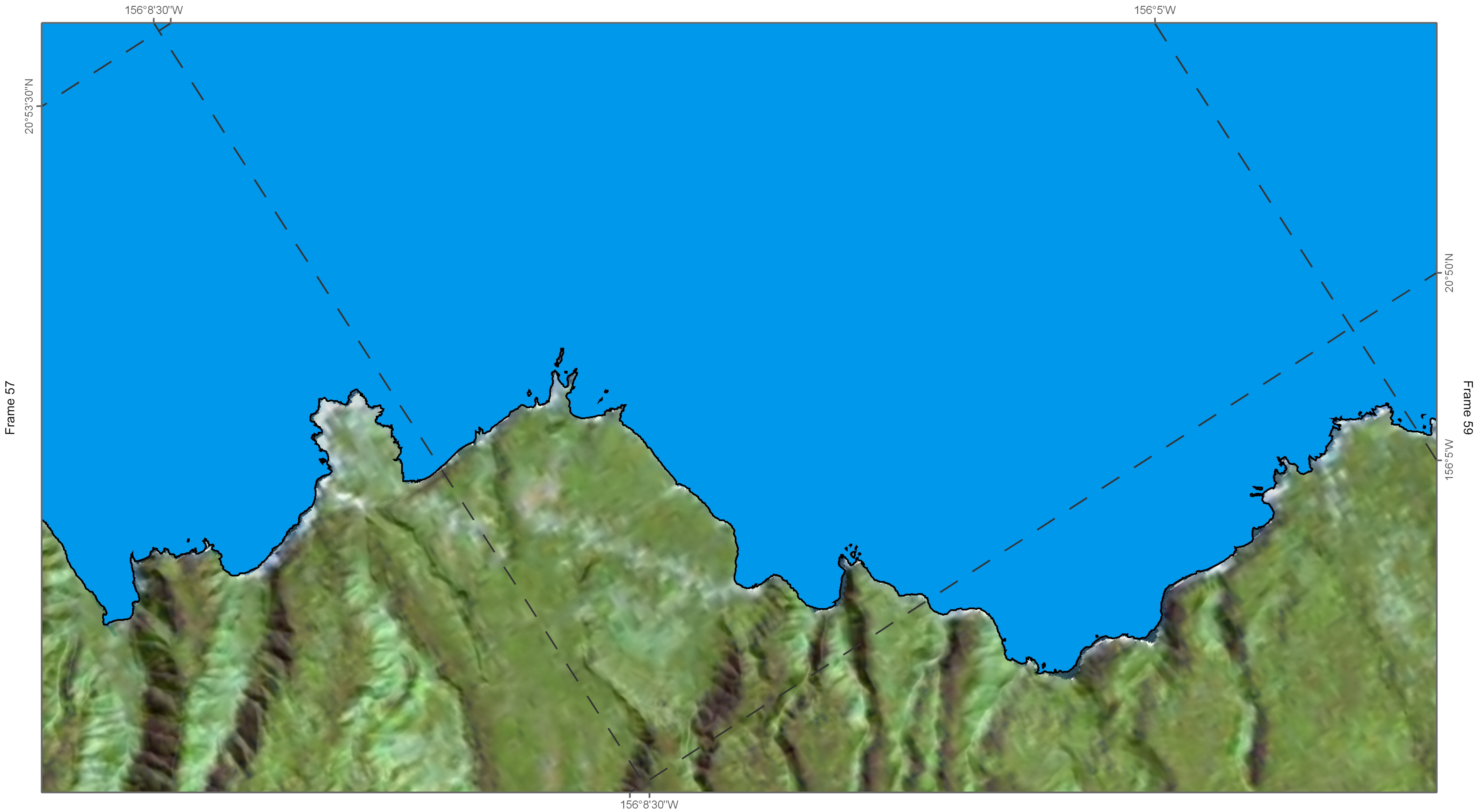
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi
1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 58)


156°8'30"W
156°5'W
20°53'30"N
Frame 57
20°50'N
Frame 59
156°5'W
156°8'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51
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72
73
74
0 5 10
km
0 50 100
km
N
W
E
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Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

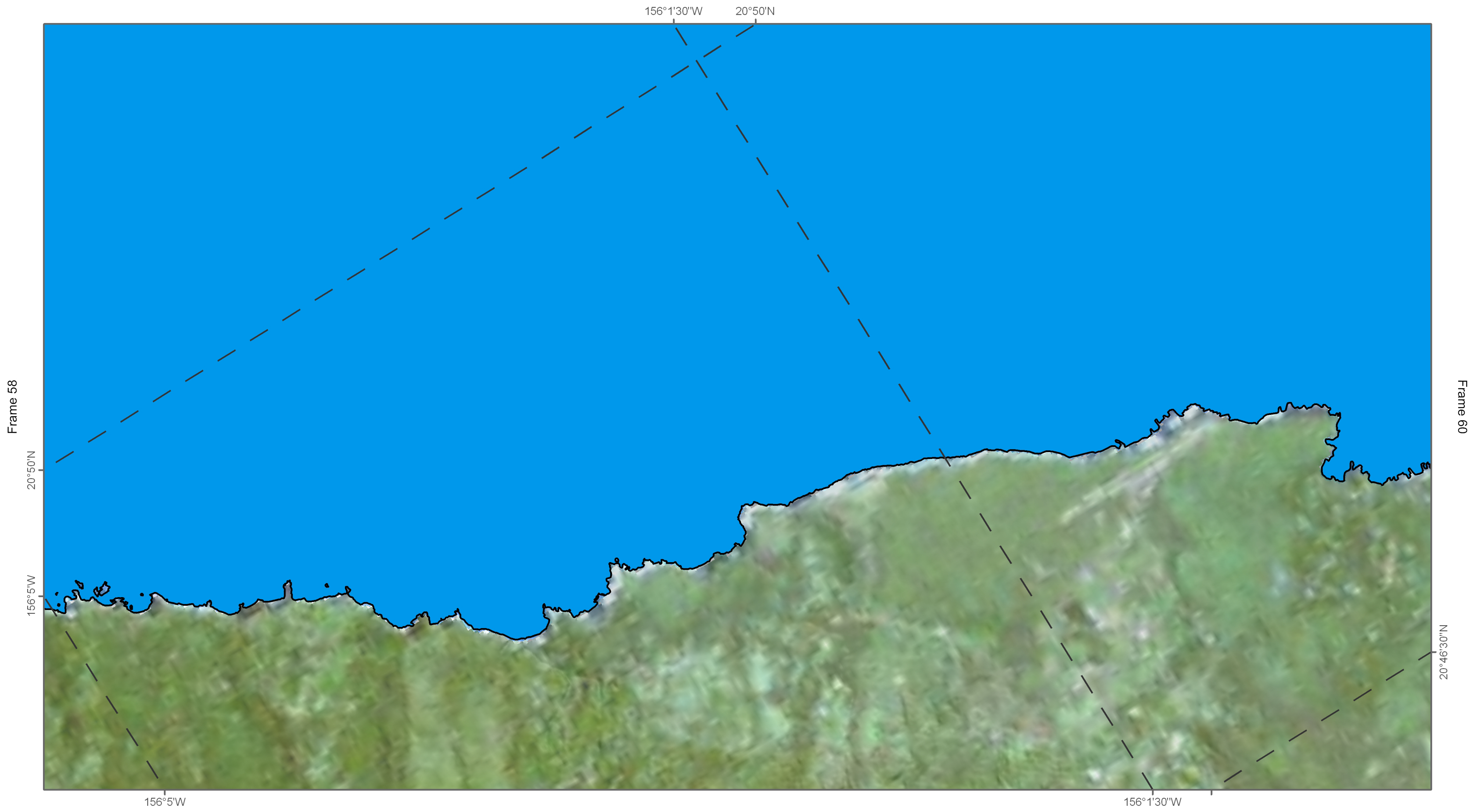
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 59)


156°1'30"W
20°50'N
Frame 58
20°50'N
156°5'W
Frame 60
20°46'30"N
156°5'W
156°1'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51
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72
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74
0 5 10
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▨ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▨ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ☐ Turf 10%-<50%
- ☒ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ☒ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

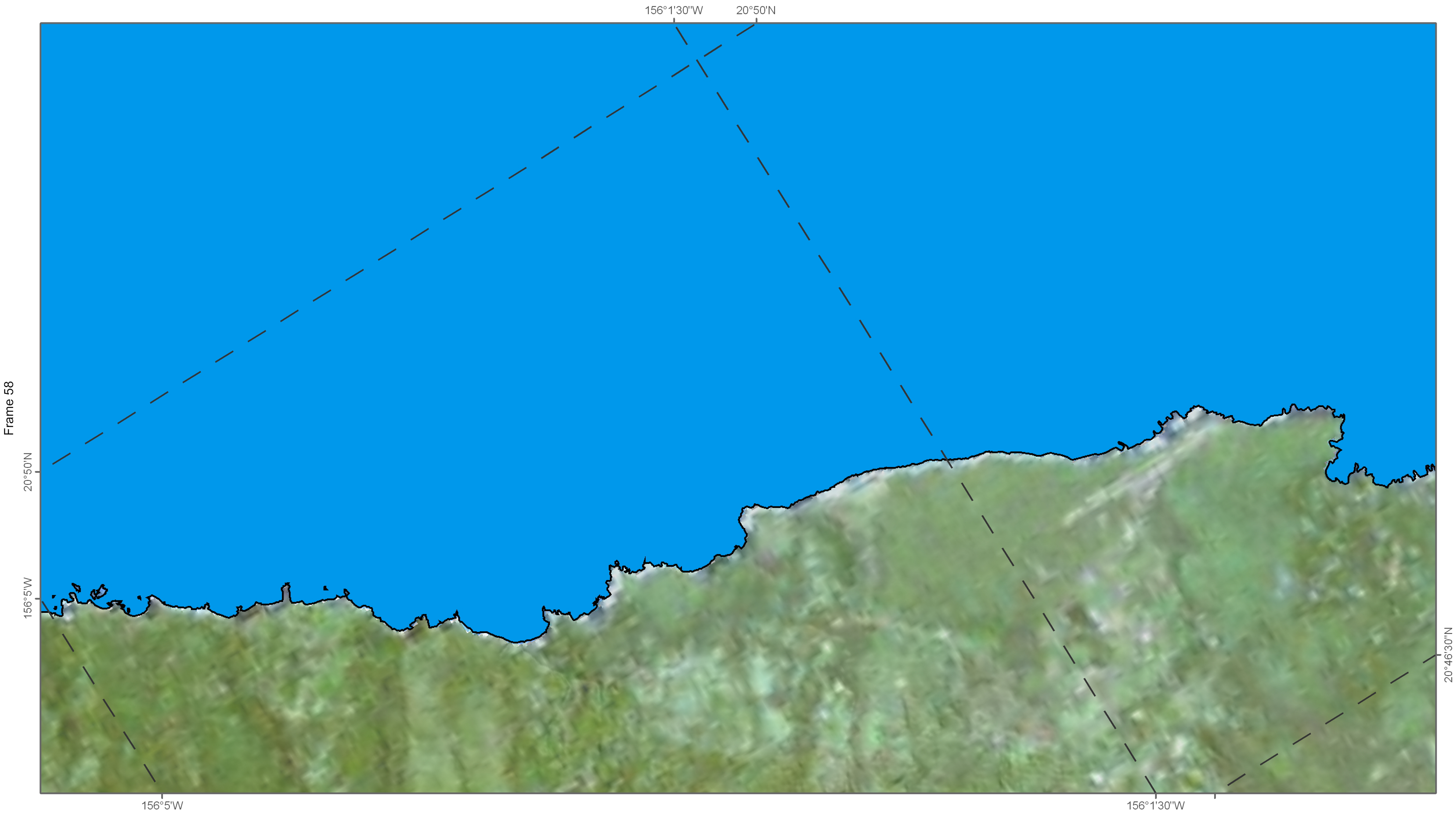
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 59)


156°1'30"W
20°50'N
Frame 58
20°50'N
156°5'W
Frame 60
20°46'30"N
156°5'W
156°1'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
Hawaii (Big Island)
N
W
E
S
0 5 10
km
0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- 🟦 Unknown

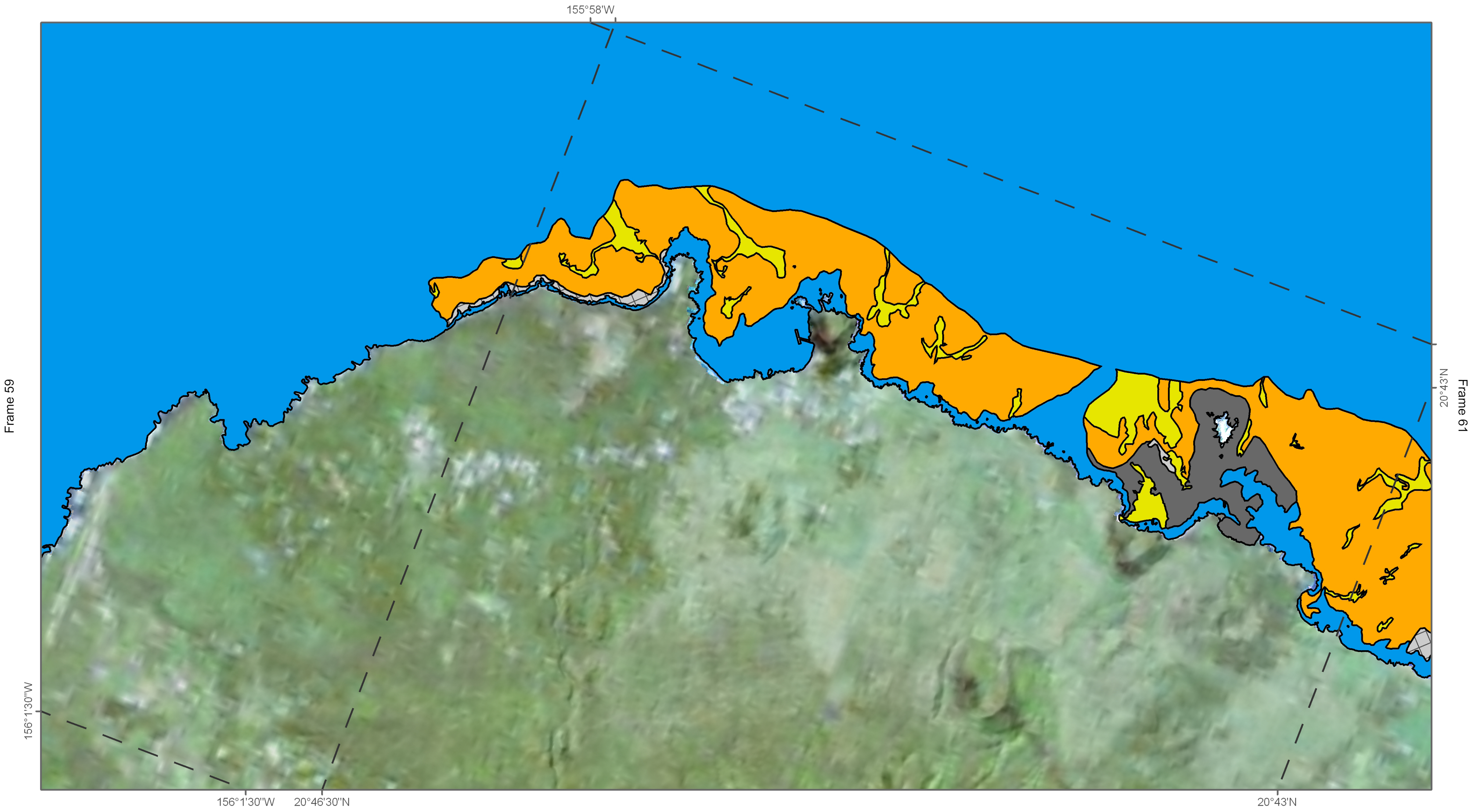
□ Minimum Mapping Unit (1 Acre)

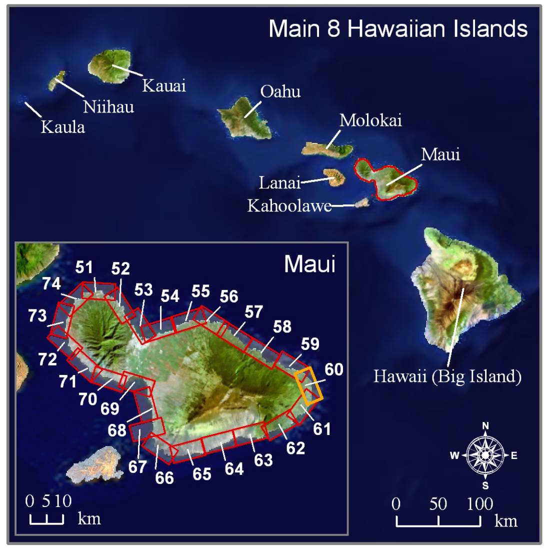
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 60)


155°58'W
Frame 59
Frame 61
20°43'N
156°1'30"W
156°1'30"W
20°46'30"N
20°43'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10 km
0 50 100 km
N S E W

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

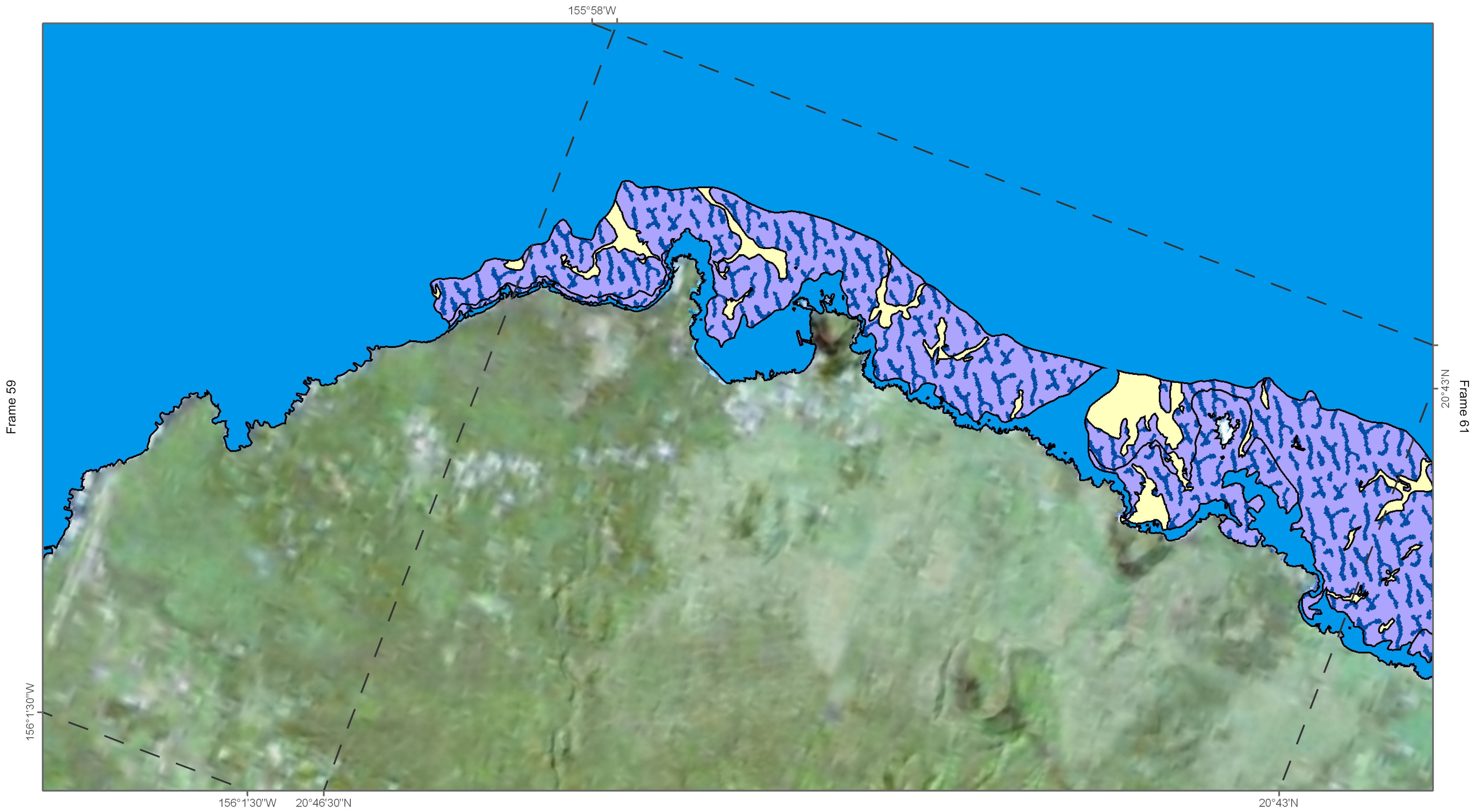
□ Minimum Mapping Unit (1 Acre)

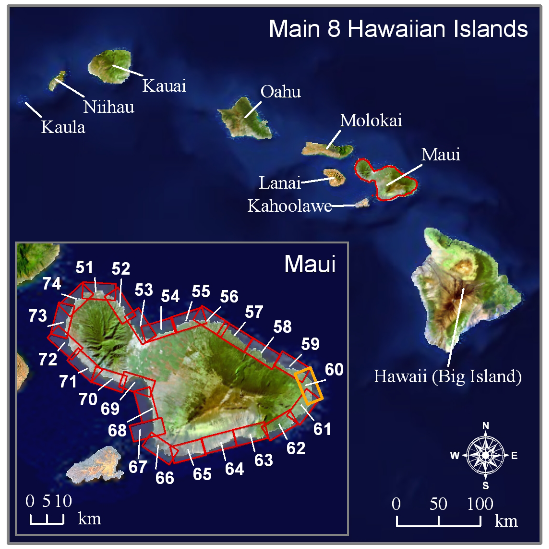
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 60)


155°58'W
Frame 59
Frame 61
20°43'N
156°1'30"W
156°1'30"W
20°46'30"N
20°43'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Maui
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74
Hawaii (Big Island)
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

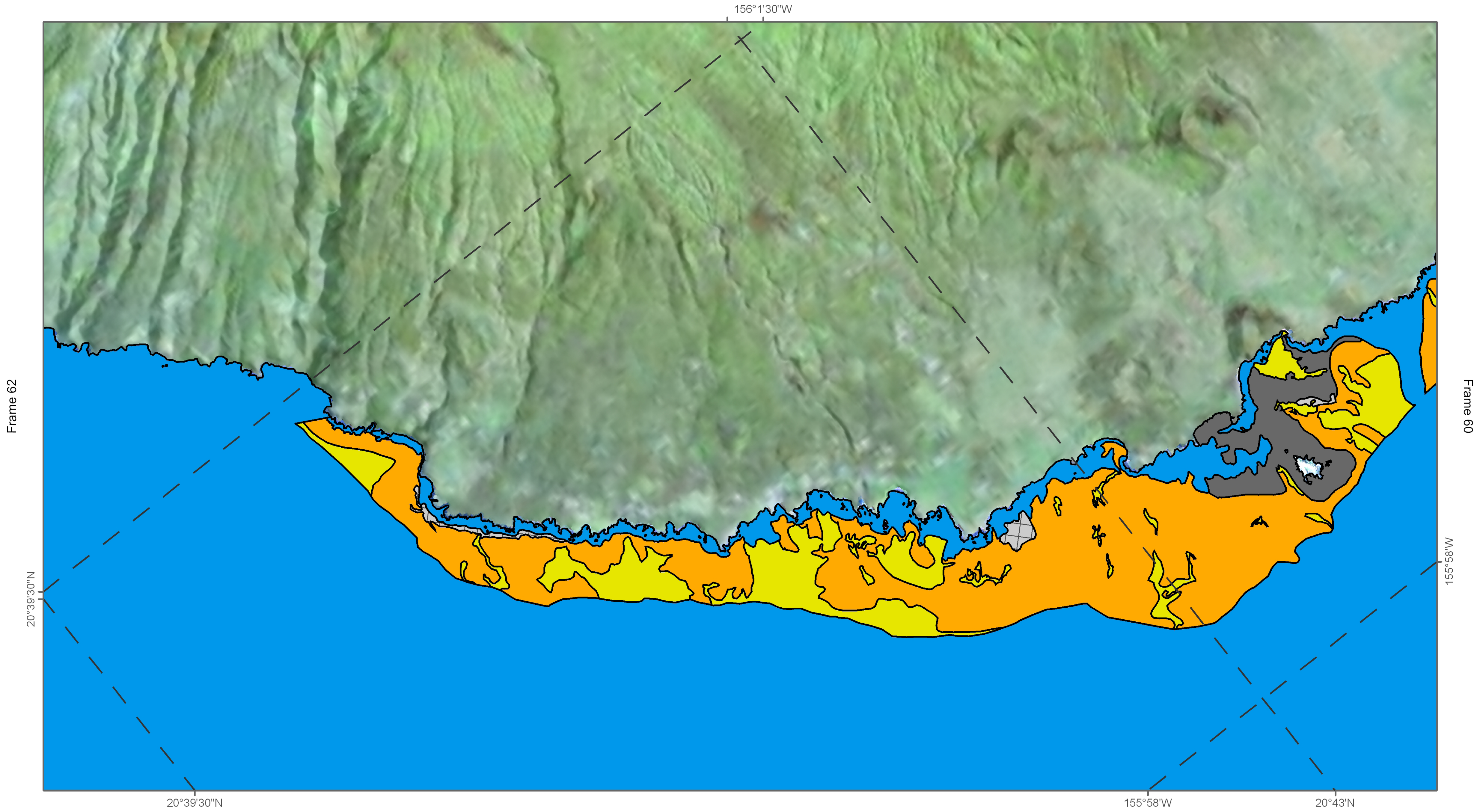
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

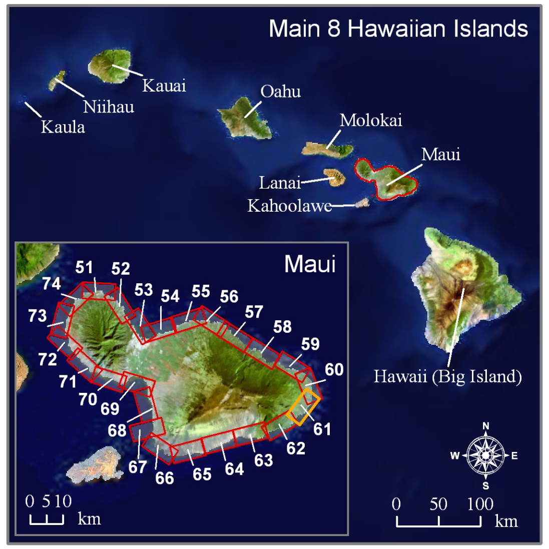
Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 61)


156°1'30"W
Frame 62
20°39'30"N
Frame 60
155°58'W
20°39'30"N
155°58'W
20°43'N

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

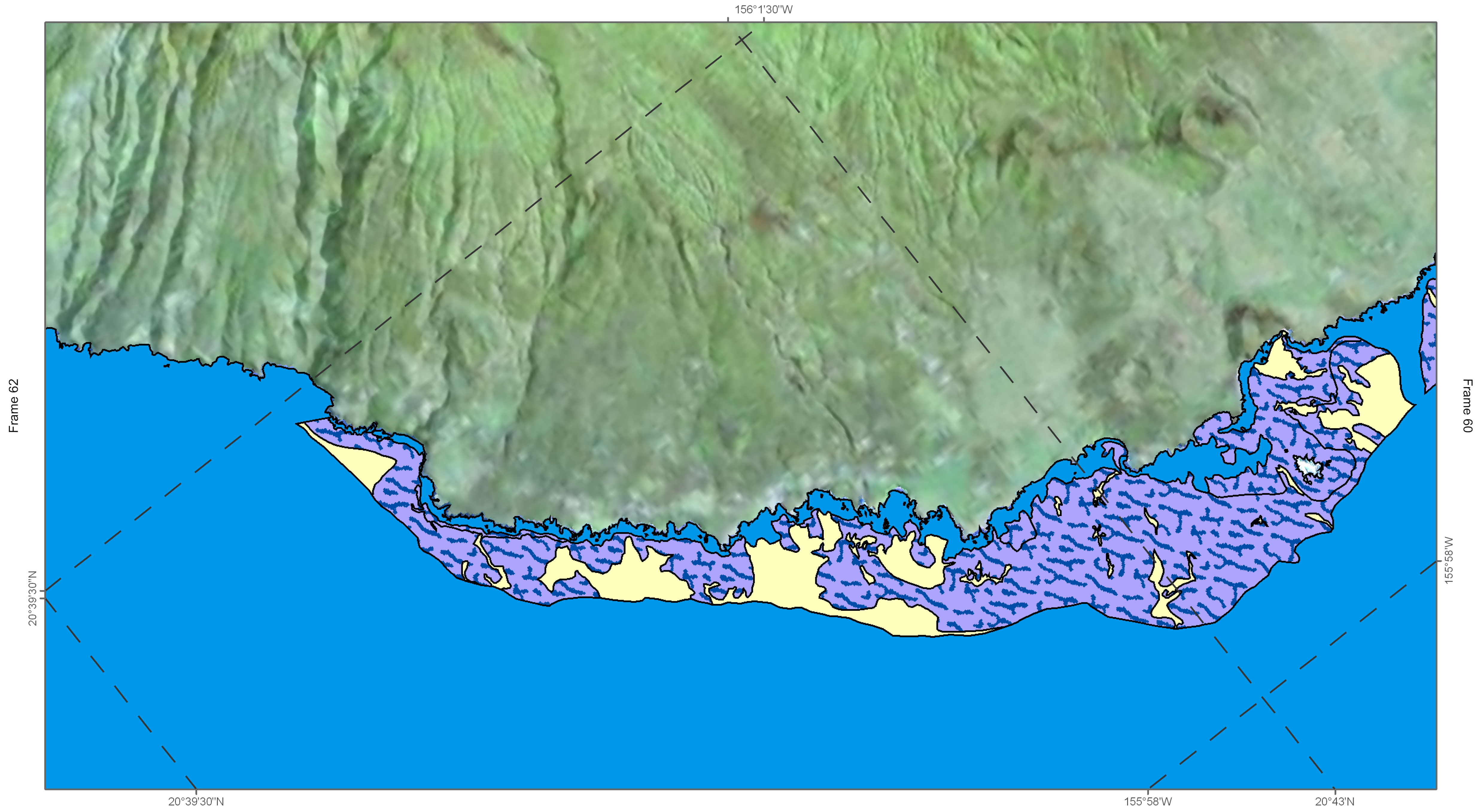

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10 km
N E S W
0 50 100 km

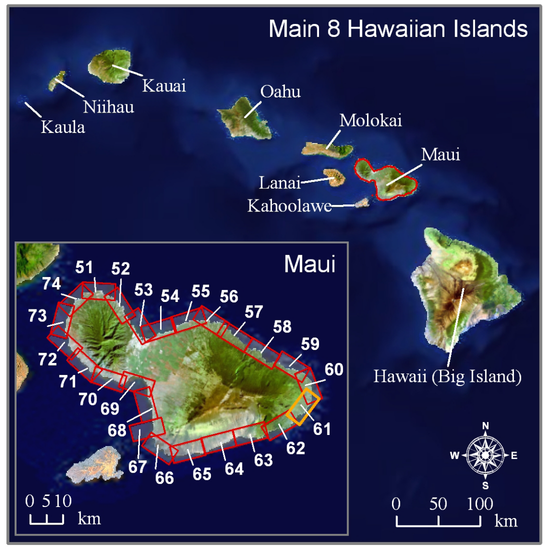
Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ⬛ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 61)


156°1'30"W
Frame 62
Frame 60
20°39'30"N
155°58'W
20°39'30"N
155°58'W
20°43'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

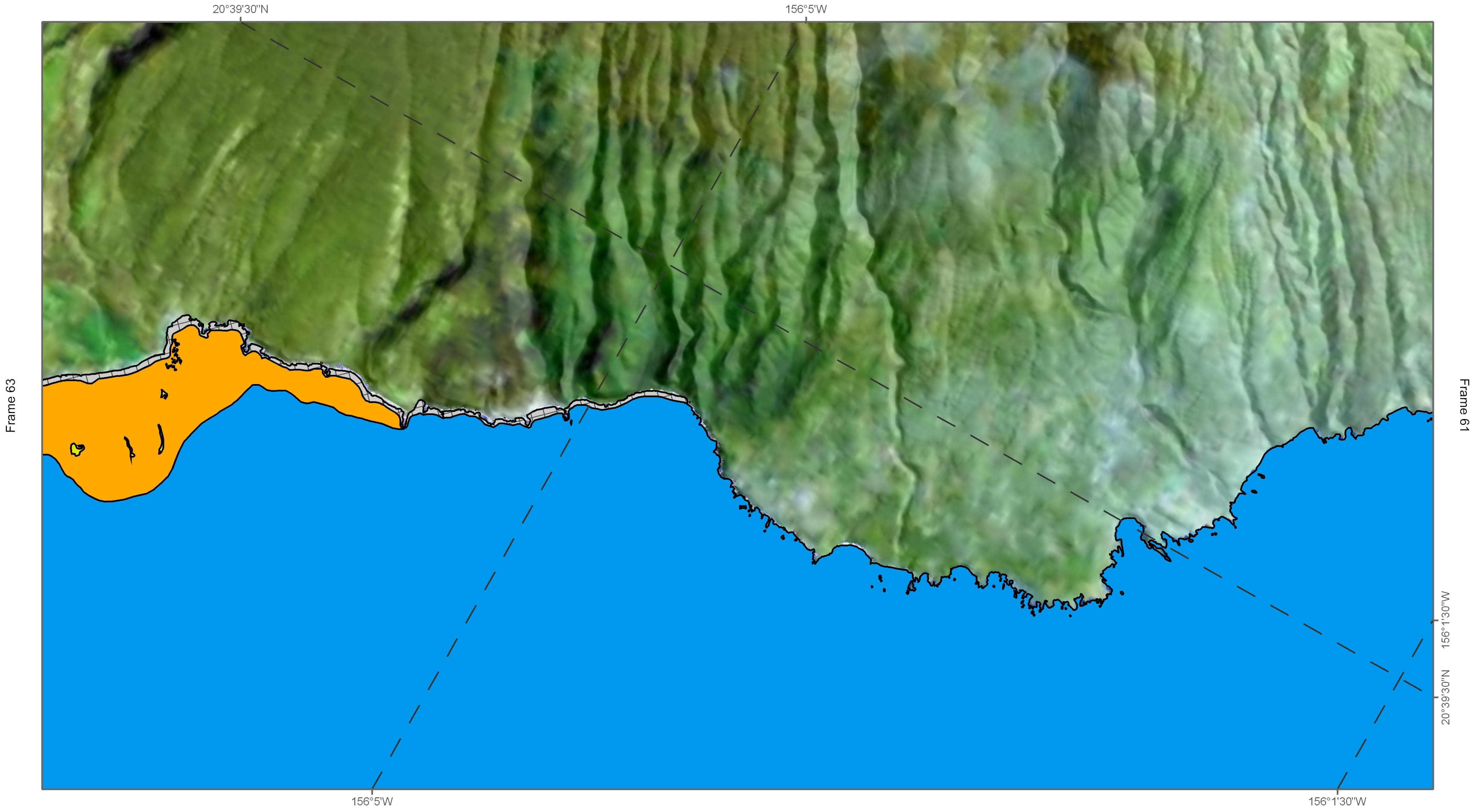
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 62)


20°39'30"N
156°5'W
Frame 63
Frame 61
156°1'30"W
20°39'30"N
156°5'W
156°1'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
0 5 10
km
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▢ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▢ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▢ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

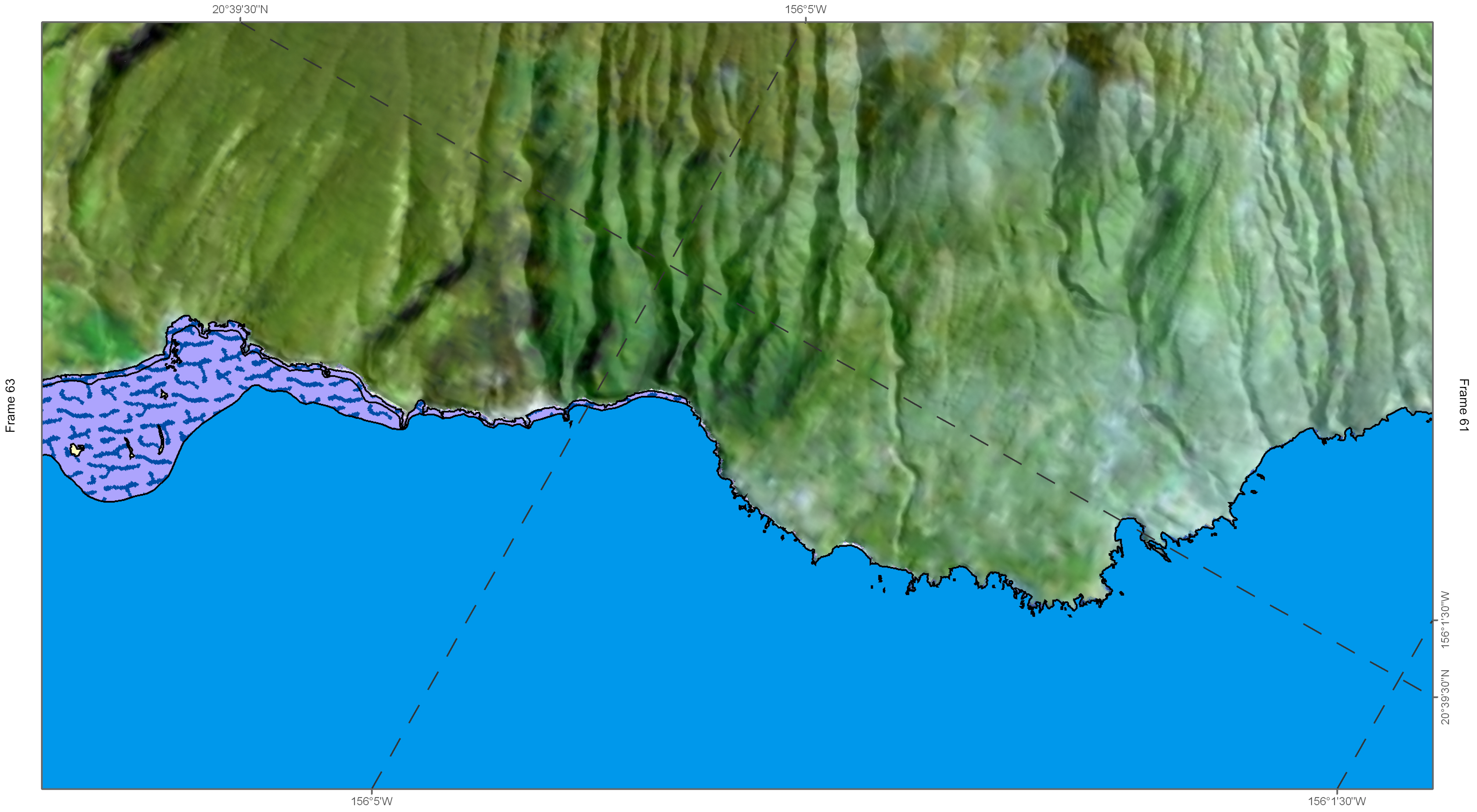
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 62)


20°39'30"N
156°5'W
Frame 63
Frame 61
156°1'30"W
20°39'30"N
156°5'W
156°1'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51
52
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58
59
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62
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64
65
66
67
68
69
70
71
72
73
74
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

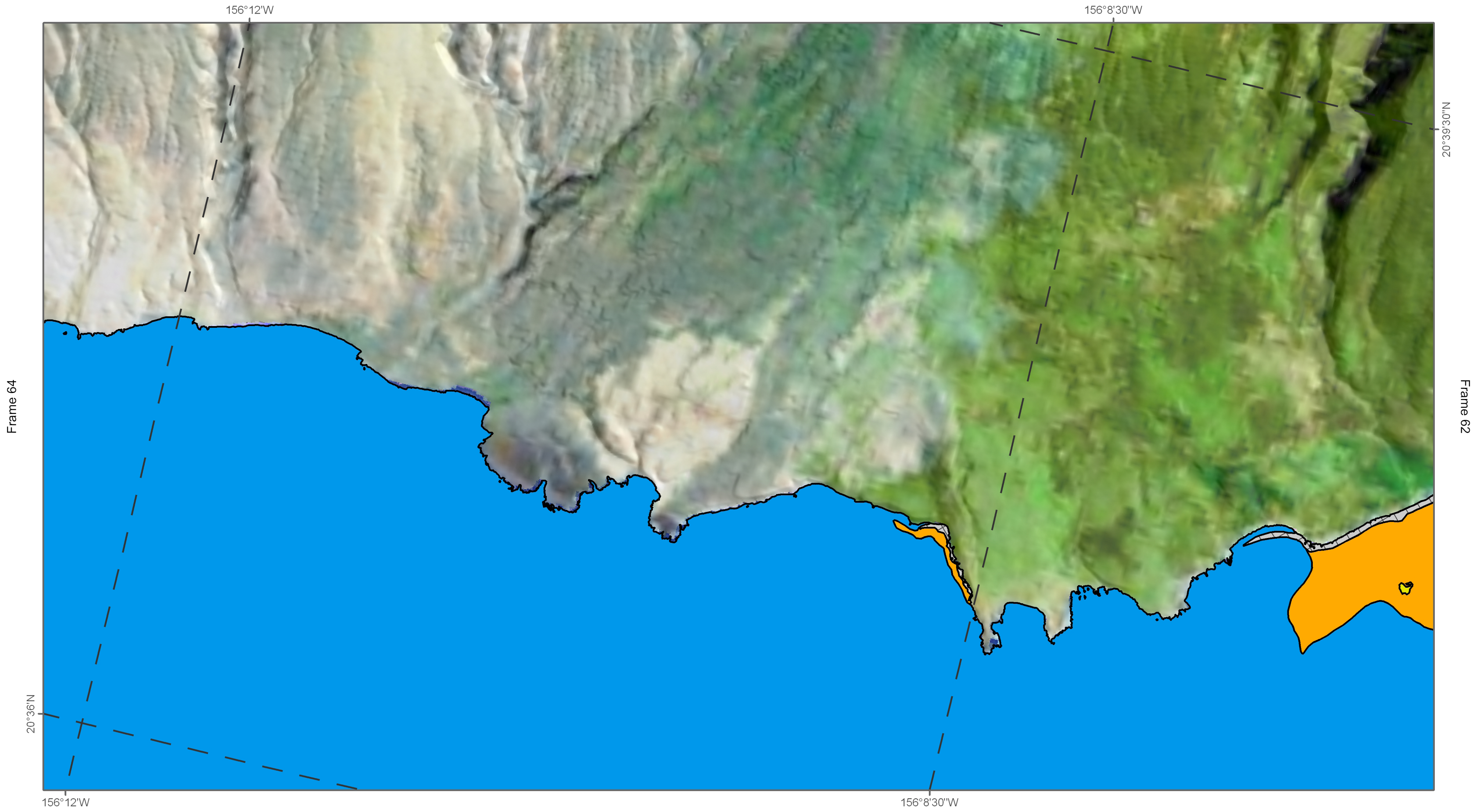
- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

☐ Minimum Mapping Unit (1 Acre)

0
0.5
1
1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 63)


156°12'W
156°8'30"W
20°39'30"N
20°36'N
Frame 64
Frame 62
156°12'W
156°8'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10
km
0 50 100
km
N
S
E
W

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ⬛ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

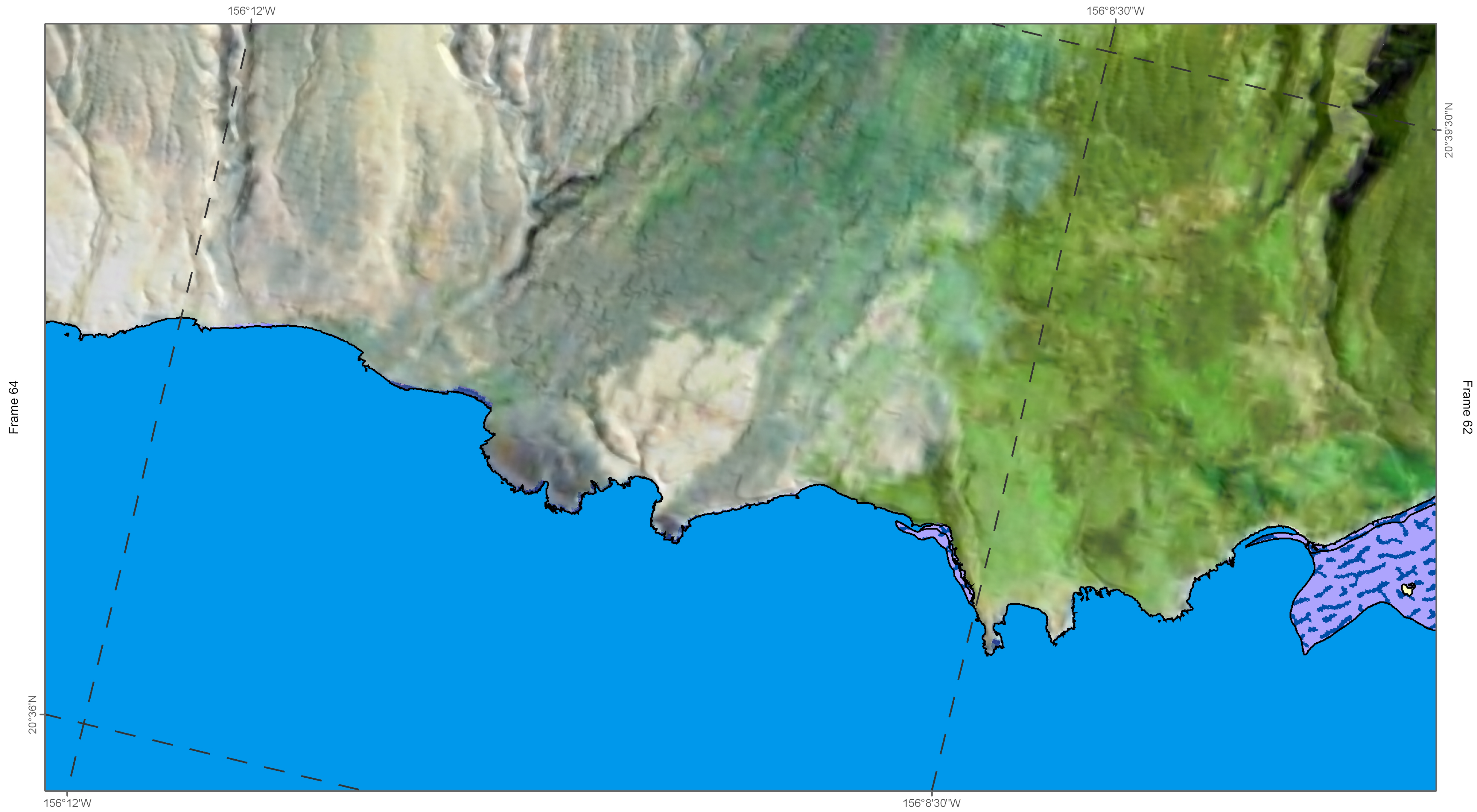
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 63)


156°12'W
156°8'30"W
20°39'30"N
20°36'N
Frame 64
Frame 62
156°12'W
156°8'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
Hawaii (Big Island)
0 5 10 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

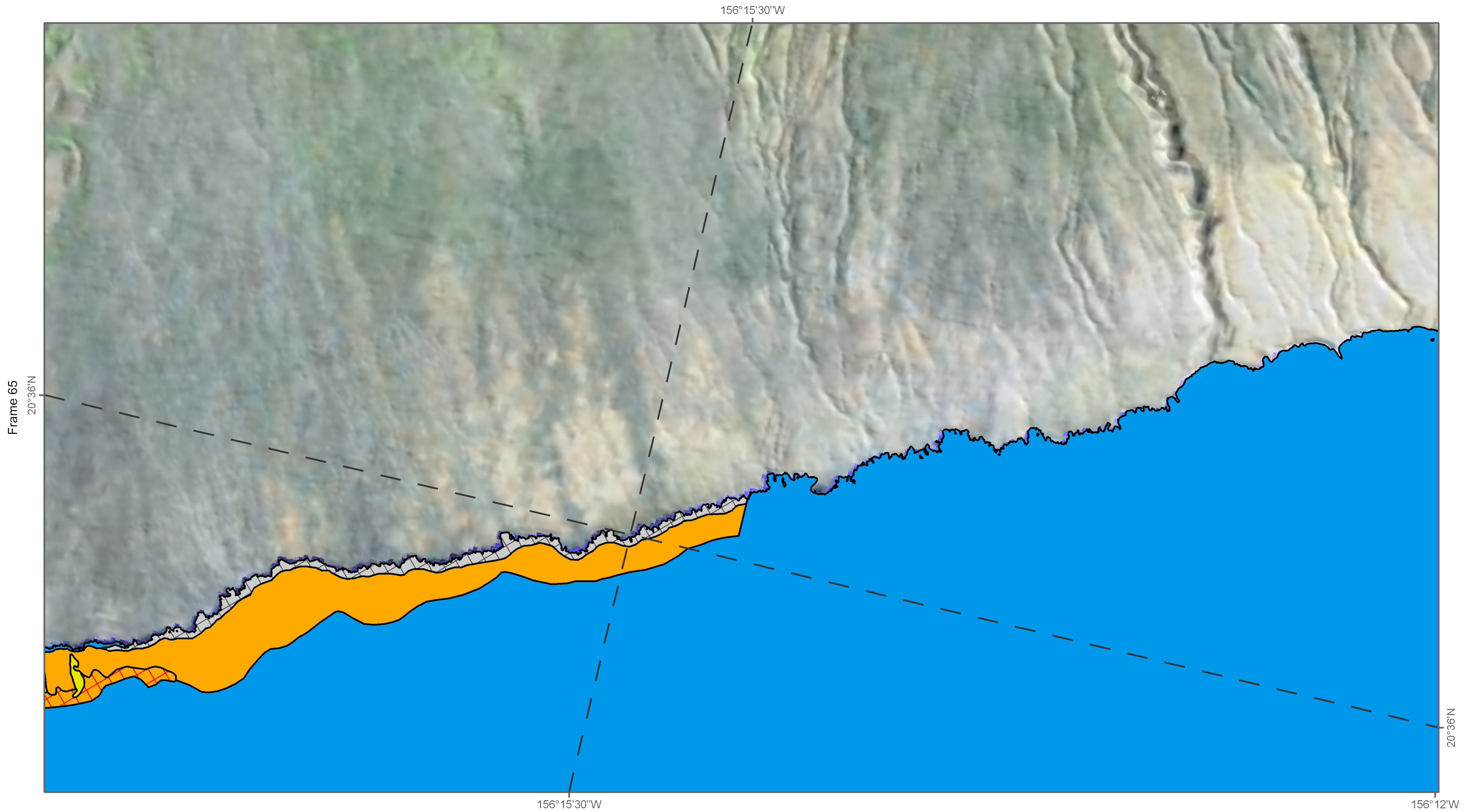
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 64)


156°15'30"W
Frame 65
20°36'N
Frame 63
20°36'N
156°15'30"W
156°12'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
0 5 10
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ⬛ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

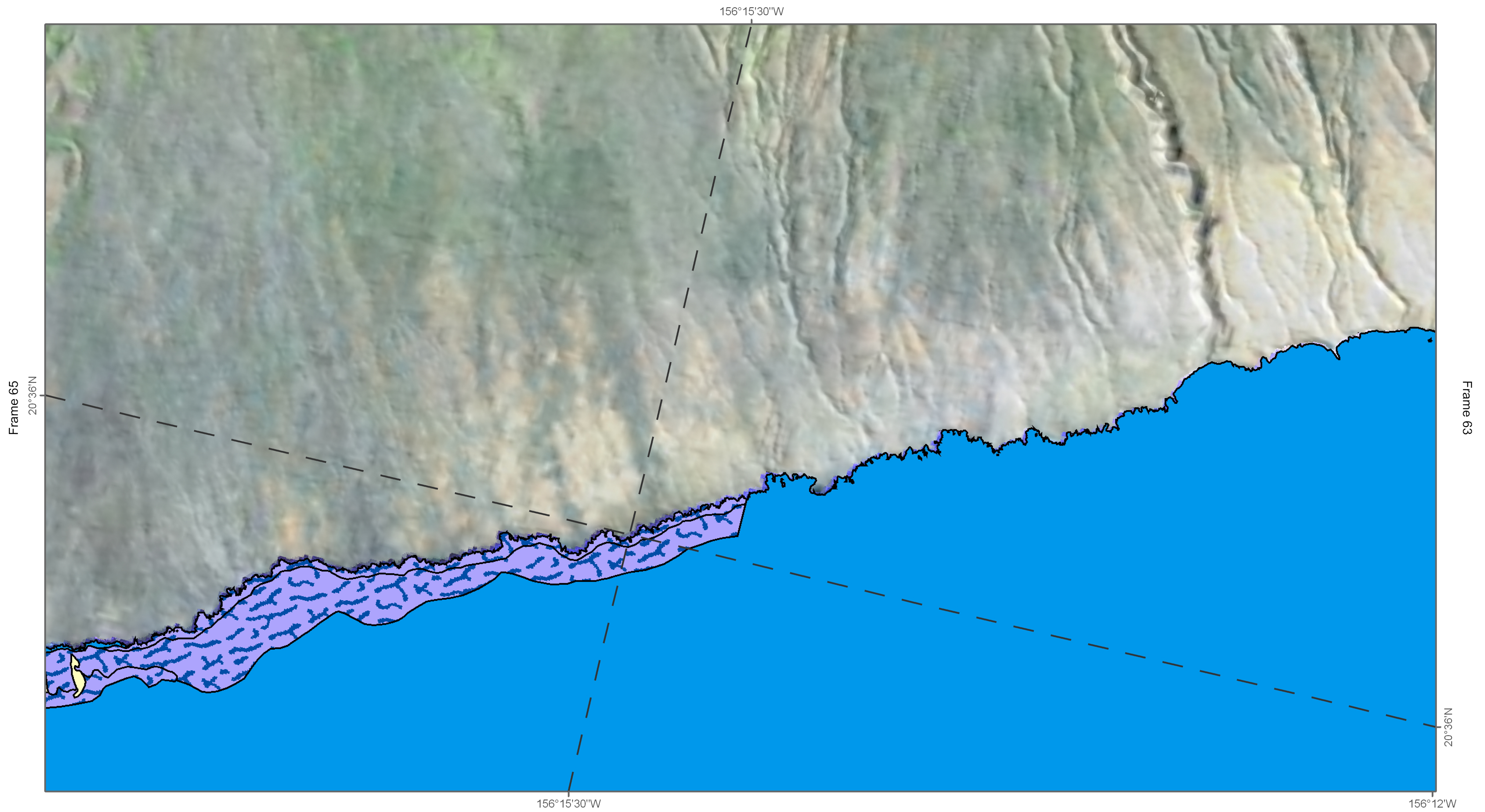
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

mi 1 0.5 0

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 64)



156°15'30"W
Frame 65
20°36'N
Frame 63
20°36'N
156°15'30"W
156°12'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10 km
0 50 100 km
N
S
W
E

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- 🟪 Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

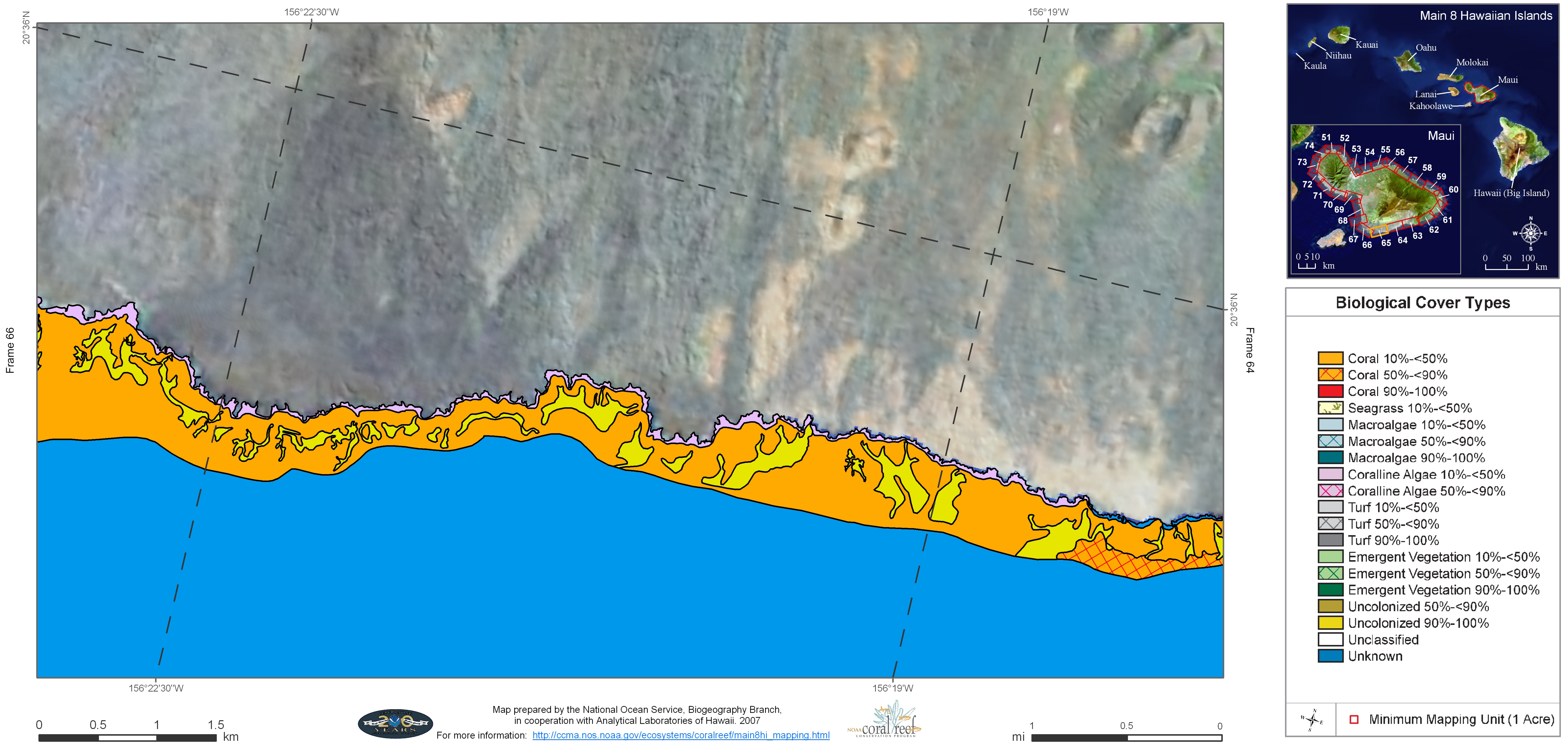
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

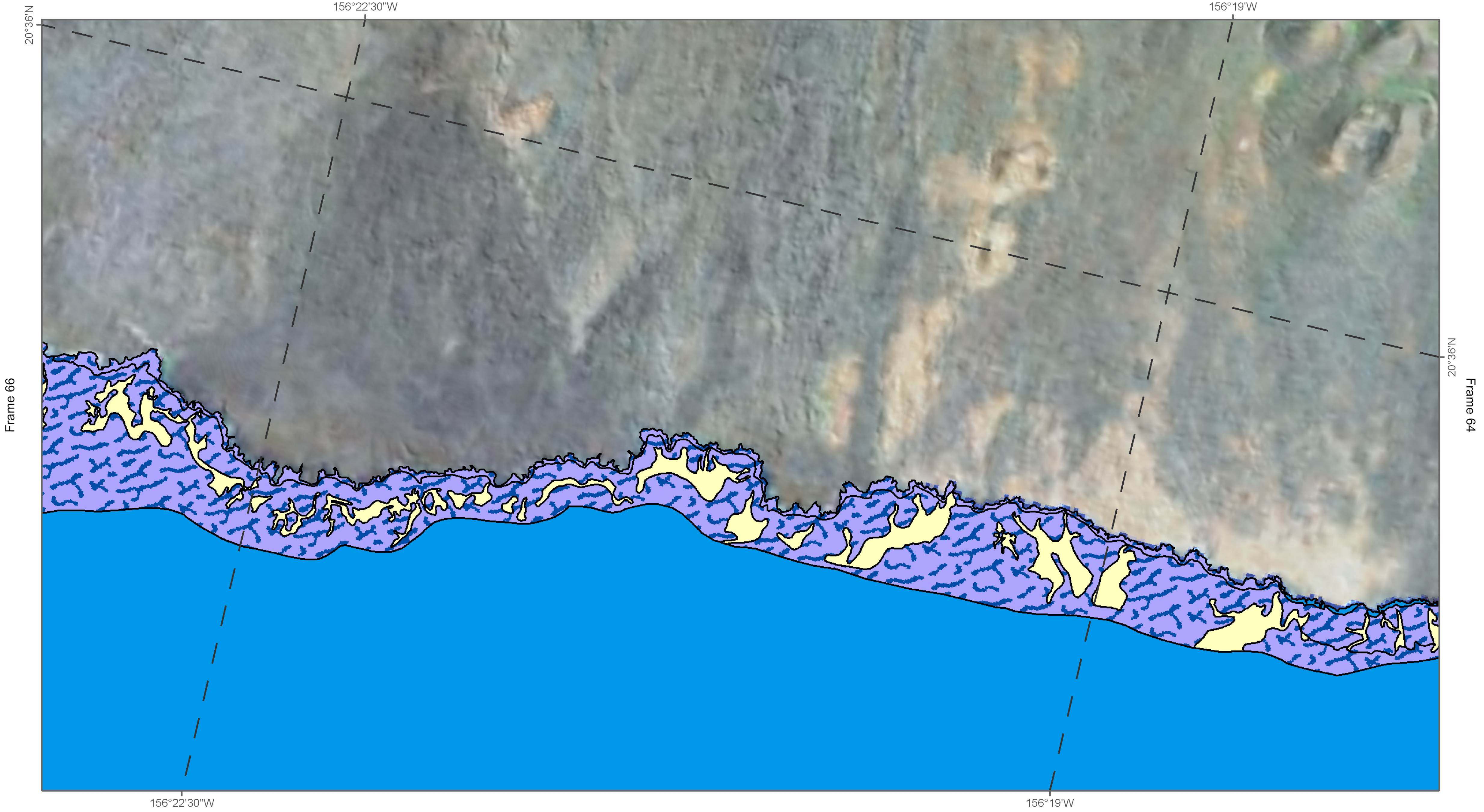
1 0.5 0 mi

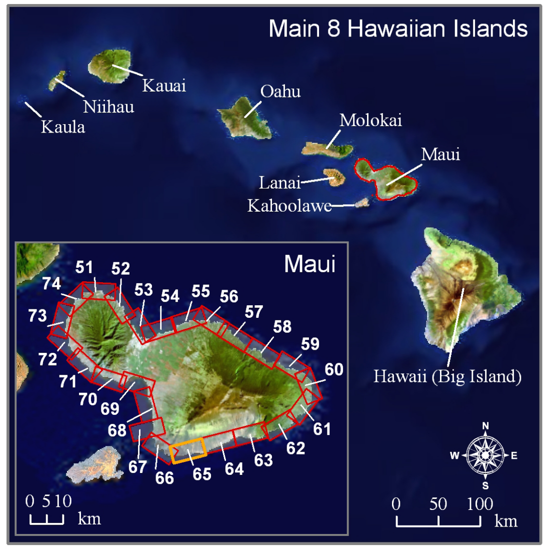
Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 65)


20°36'N
156°22'30"W
156°19'W
Frame 66
Frame 64
20°36'N
156°22'30"W
156°19'W
0
0.5
1
1.5
km
mi
1
0.5
0
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
0 5 10
km
0 50 100
km
Biological Cover Types
Coral 10%-<50%
Coral 50%-<90%
Coral 90%-100%
Seagrass 10%-<50%
Macroalgae 10%-<50%
Macroalgae 50%-<90%
Macroalgae 90%-100%
Coralline Algae 10%-<50%
Coralline Algae 50%-<90%
Turf 10%-<50%
Turf 50%-<90%
Turf 90%-100%
Emergent Vegetation 10%-<50%
Emergent Vegetation 50%-<90%
Emergent Vegetation 90%-100%
Uncolonized 50%-<90%
Uncolonized 90%-100%
Unclassified
Unknown
Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 65)


156°22'30"W
156°19'W
20°36'N
20°36'N
Frame 66
Frame 64
156°22'30"W
156°19'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10 km
0 50 100 km
N S E W

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
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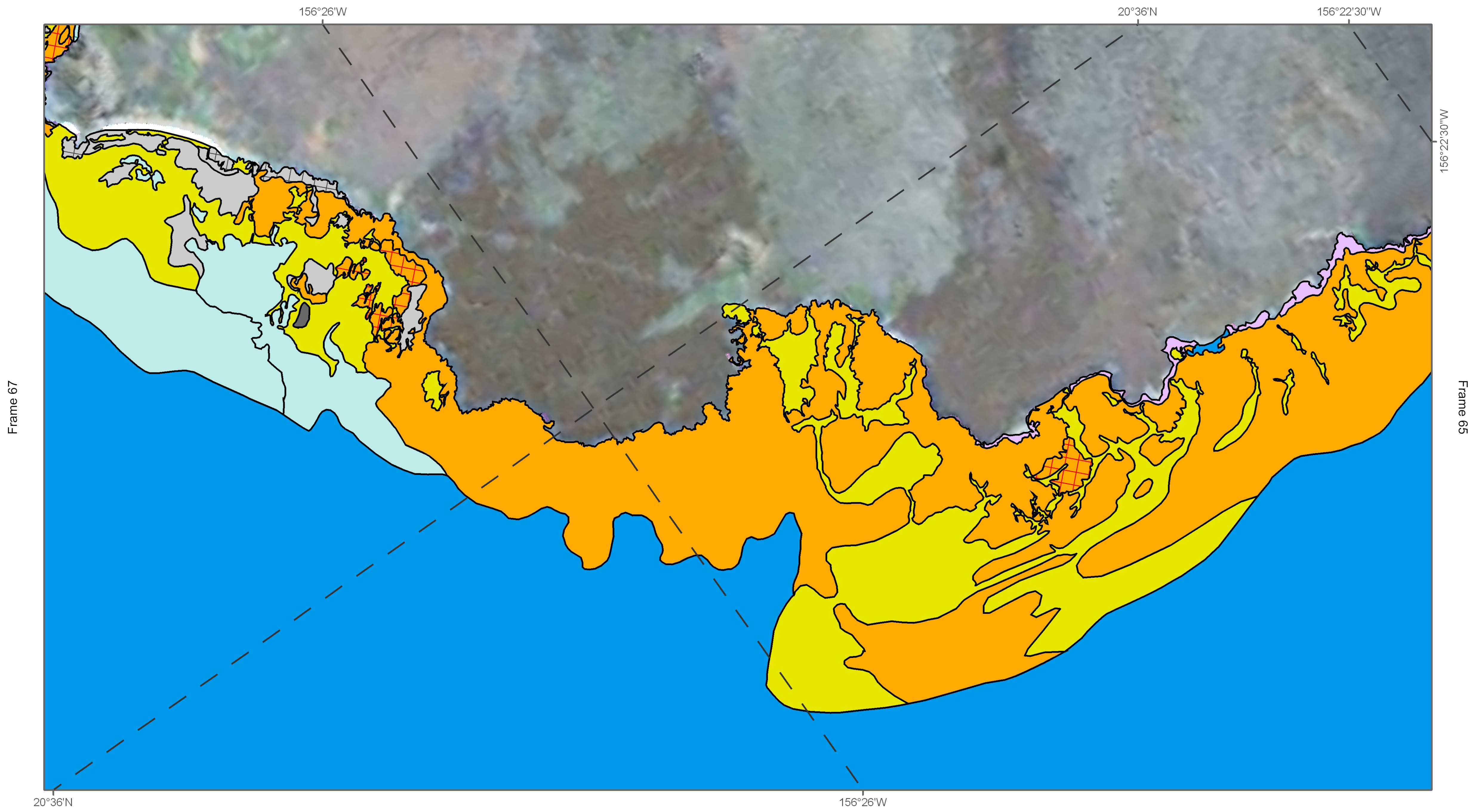
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 66)


156°26'W
20°36'N
156°22'30"W
156°22'30"W
Frame 67
Frame 65
20°36'N
156°26'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100
km
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

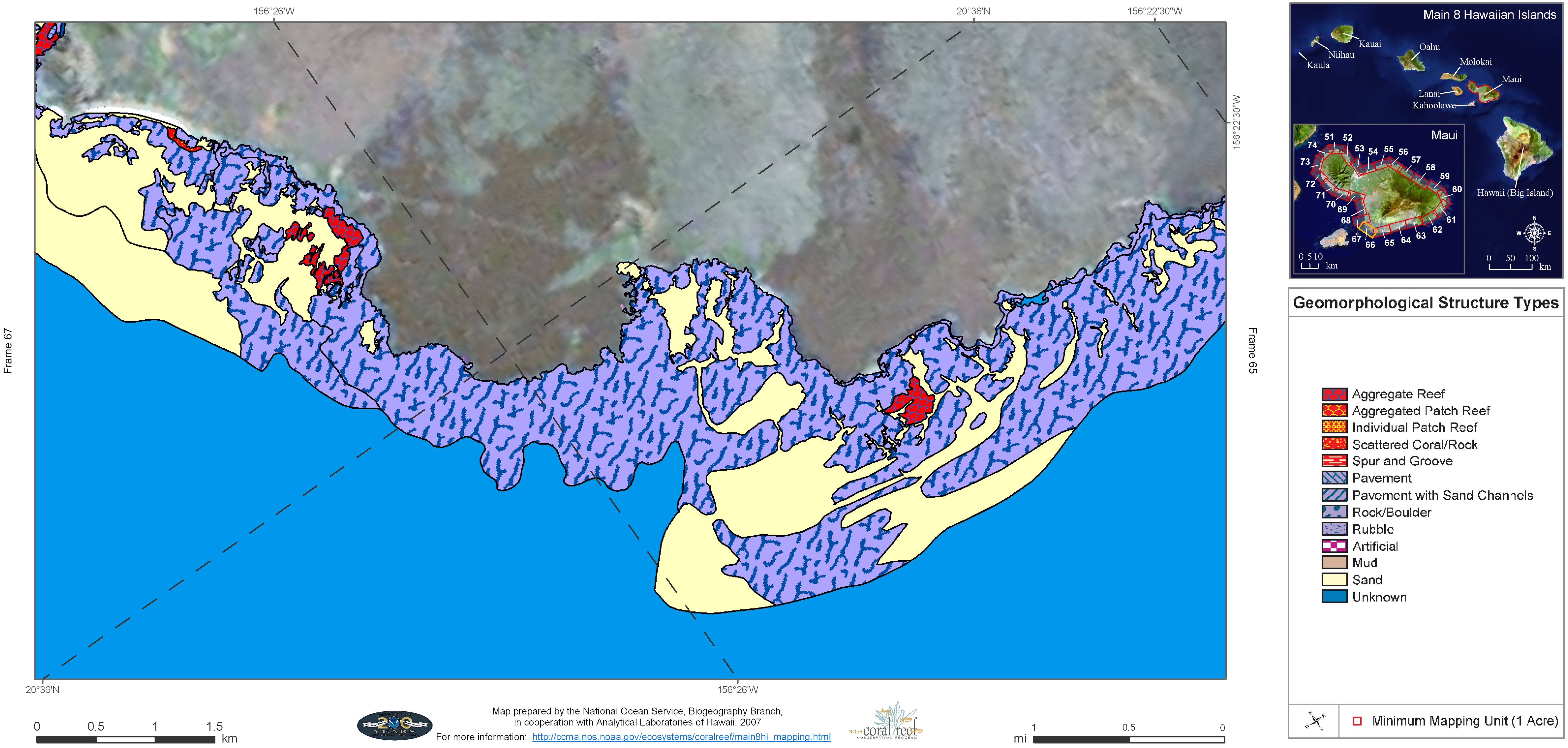
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

1 0.5 0
mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 66)


156°26'W
20°36'N
156°22'30"W
156°22'30"W
Frame 67
Frame 65
20°36'N
156°26'W
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10 km
0 50 100 km
N
E
S
W
0 0.5 1 1.5 km
1 0.5 0 mi

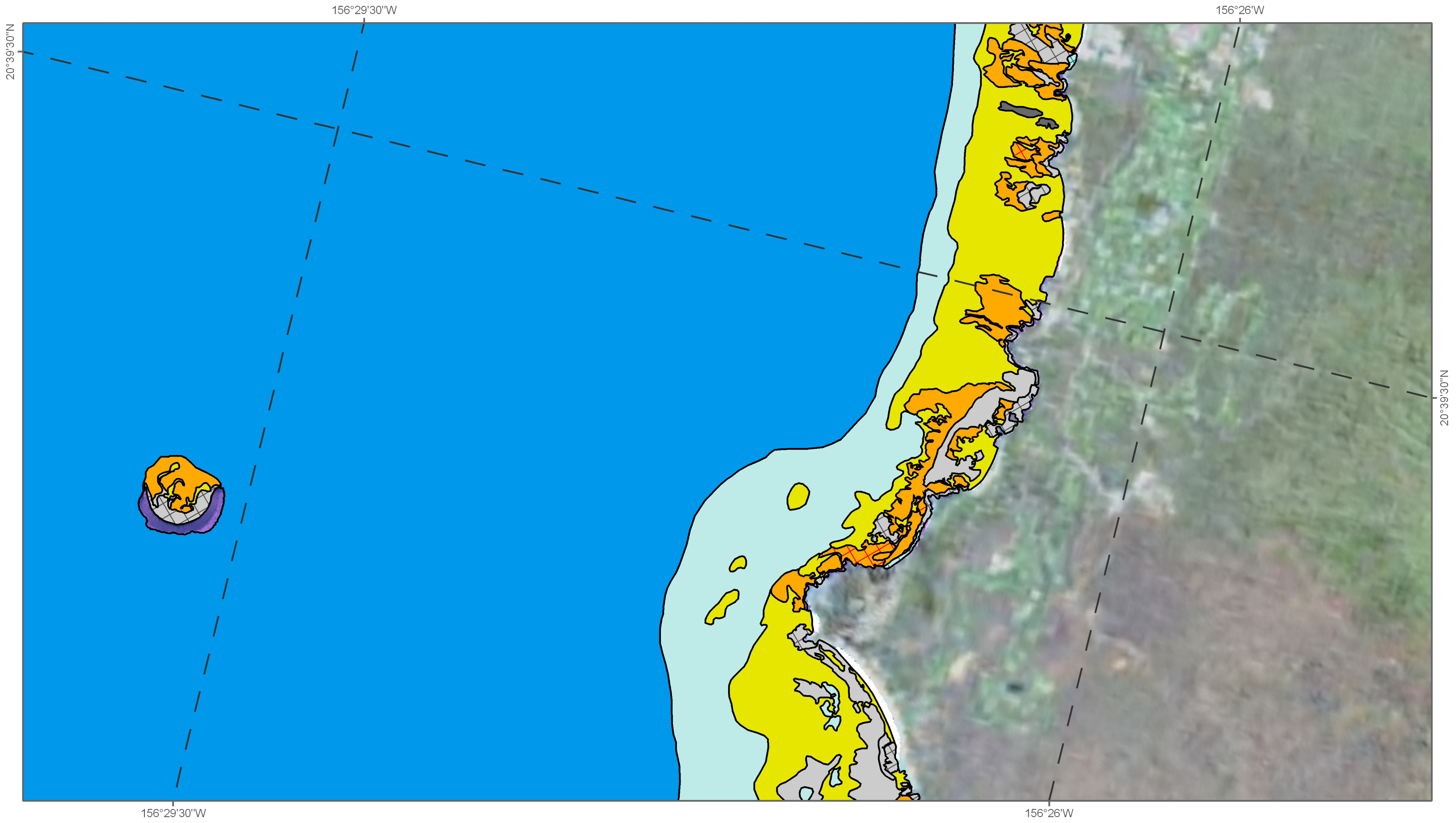
Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 67)


156°29'30"W
156°26'W
20°39'30"N
20°39'30"N
156°29'30"W
156°26'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10 km
0 50 100 km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

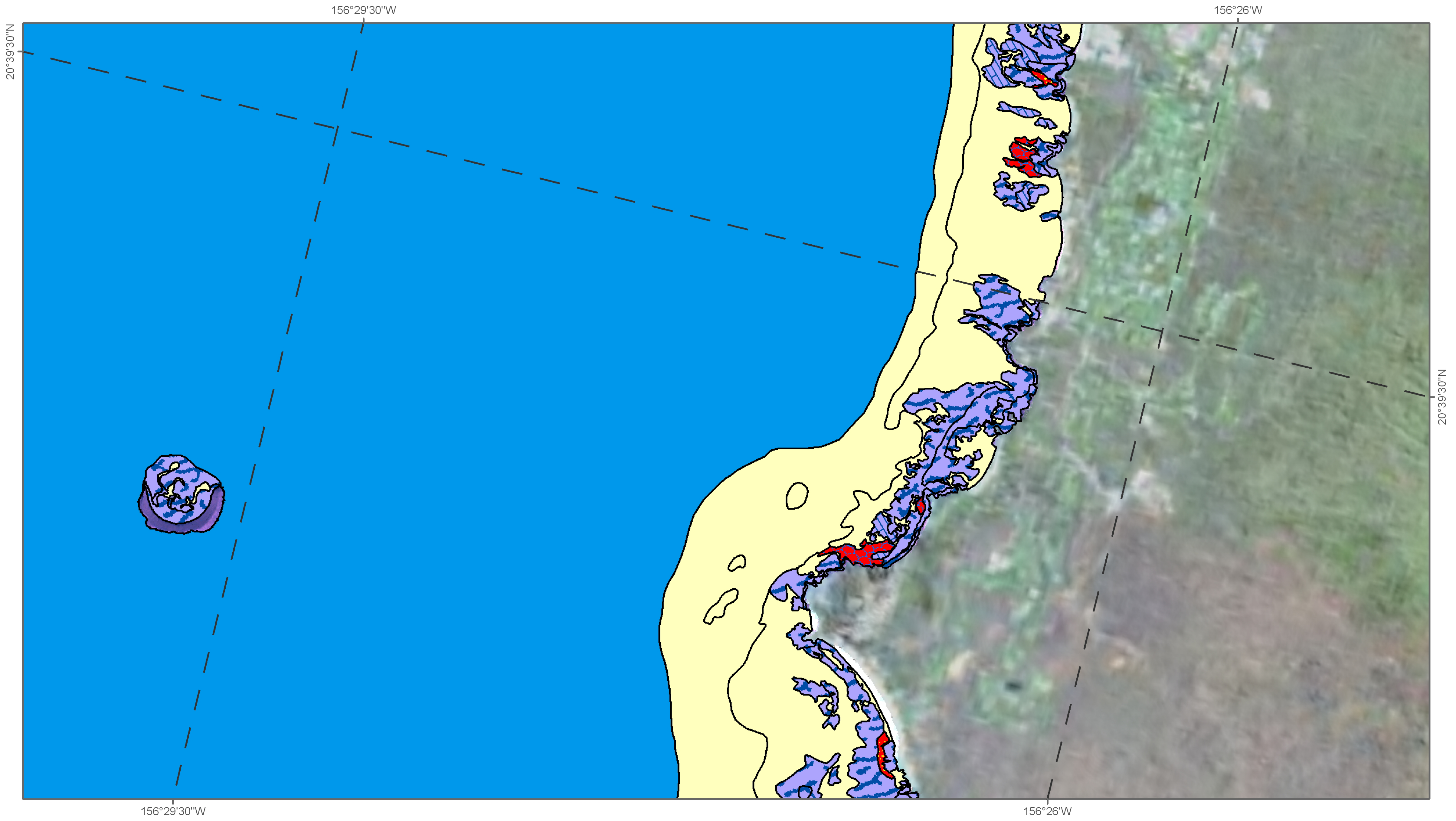
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 67)


156°29'30"W
156°26'W
20°39'30"N
20°39'30"N
156°29'30"W
156°26'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51
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65
66
67
68
69
70
71
72
73
74
0 5 10
km
0 50 100
km
N
E
S
W

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ☐ Sand
- 🟦 Unknown

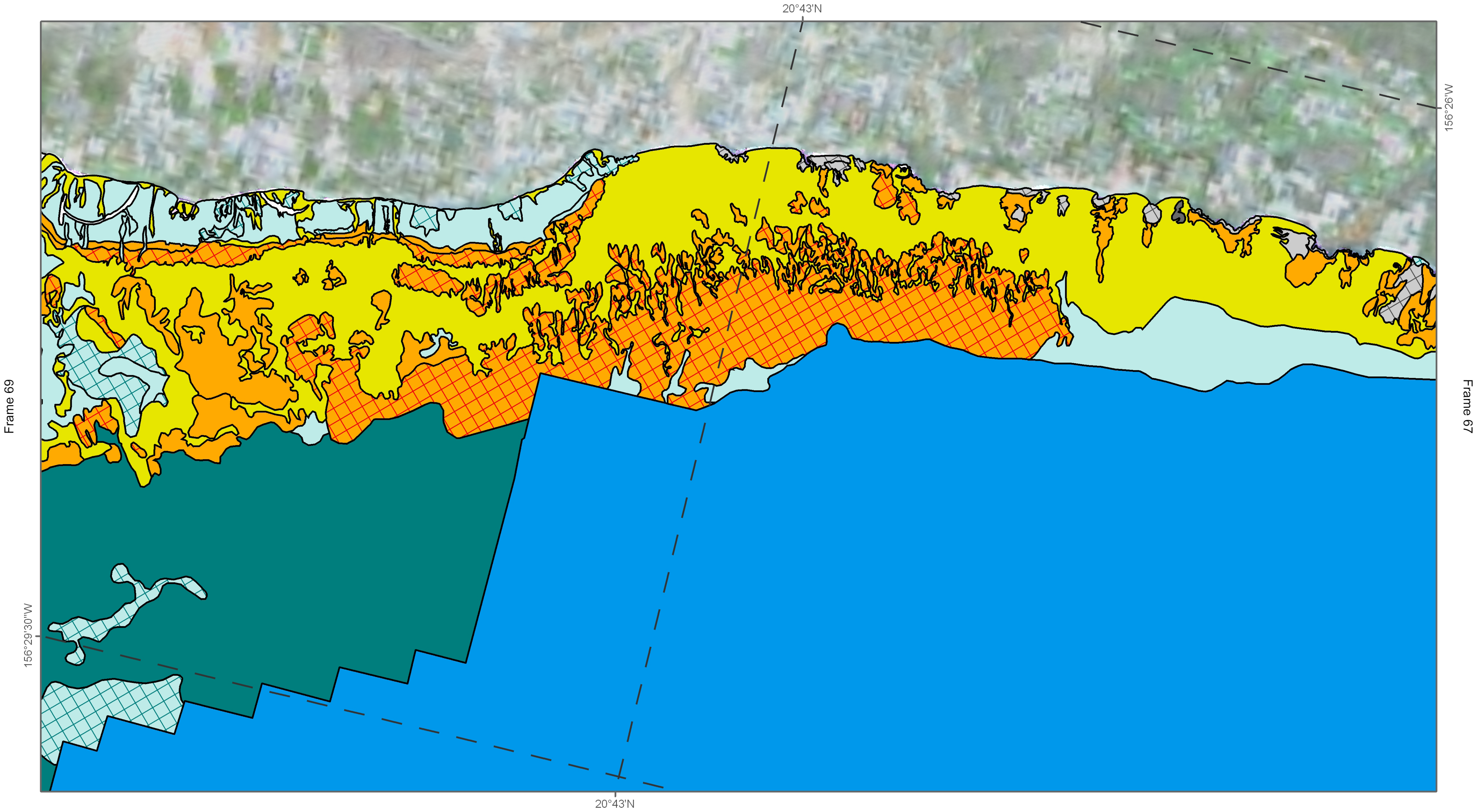
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 68)


20°43'N
156°26'W
Frame 69
Frame 67
156°29'30"W
20°43'N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100
km
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10
km

Biological Cover Types

🟧 Coral 10%-<50%
▨ Coral 50%-<90%
🟥 Coral 90%-100%
▨ Seagrass 10%-<50%
⬜ Macroalgae 10%-<50%
▨ Macroalgae 50%-<90%
⬛ Macroalgae 90%-100%
⬜ Coralline Algae 10%-<50%
▨ Coralline Algae 50%-<90%
⬜ Turf 10%-<50%
▨ Turf 50%-<90%
⬛ Turf 90%-100%
🟩 Emergent Vegetation 10%-<50%
▨ Emergent Vegetation 50%-<90%
🟩 Emergent Vegetation 90%-100%
🟫 Uncolonized 50%-<90%
🟨 Uncolonized 90%-100%
⬜ Unclassified
🟦 Unknown

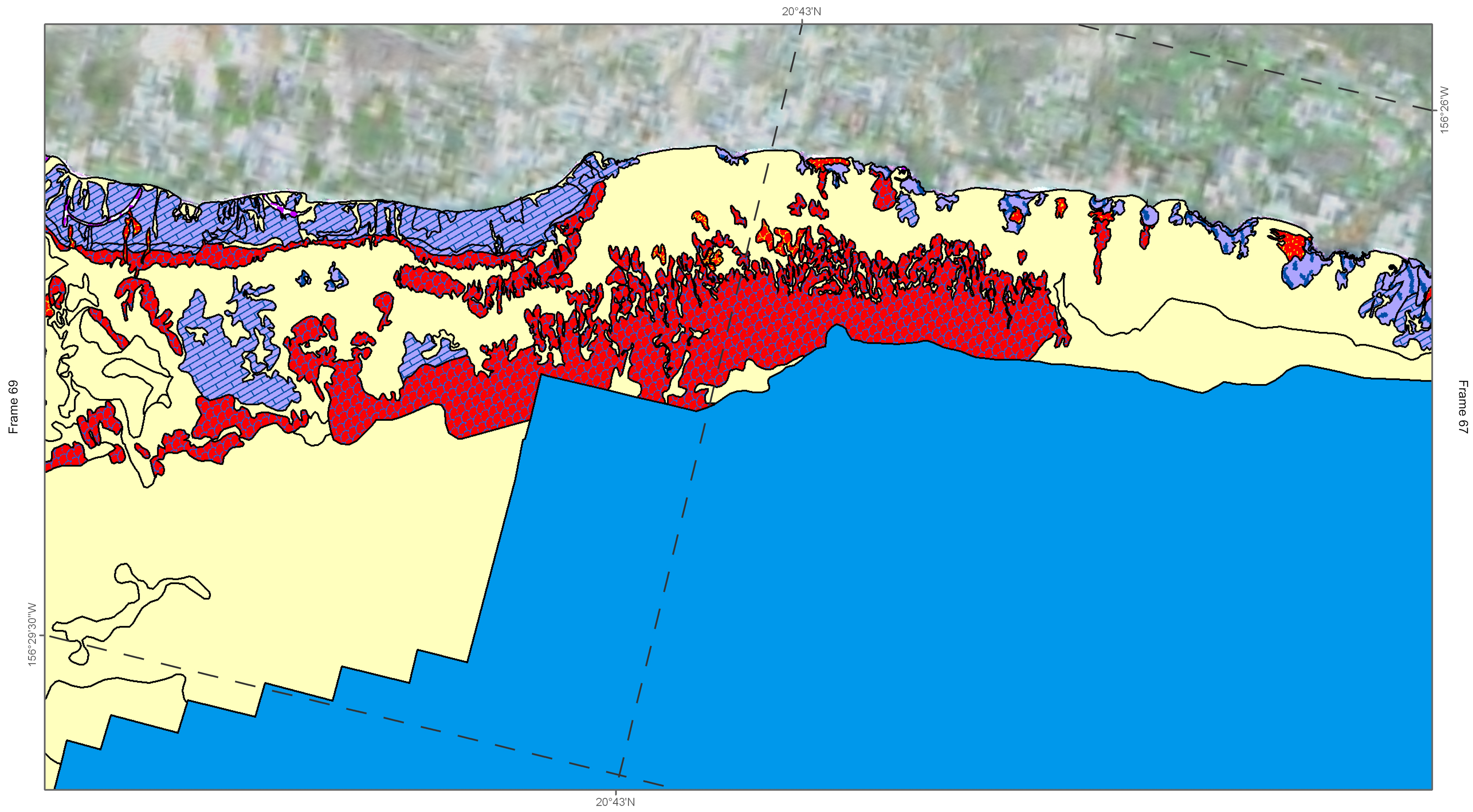
🟥 Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 68)


20°43'N
156°26'W
Frame 69
Frame 67
156°29'30"W
20°43'N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
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0 5 10
km
0 50 100
km
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E
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Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

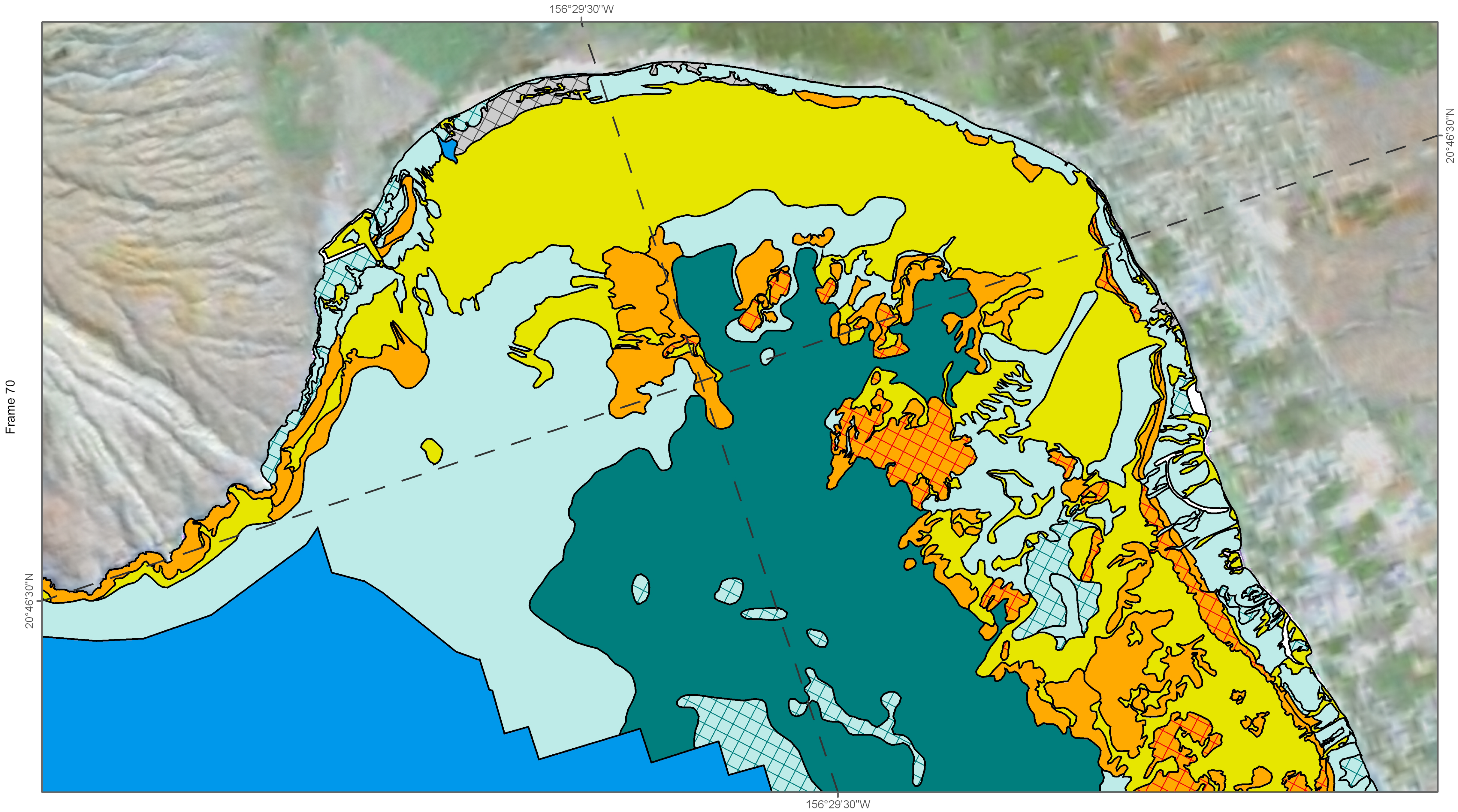
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 69)


156°29'30"W
20°46'30"N
Frame 70
20°46'30"N
156°29'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
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73
74
0 5 10
km
Hawaii (Big Island)
N
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0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

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For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

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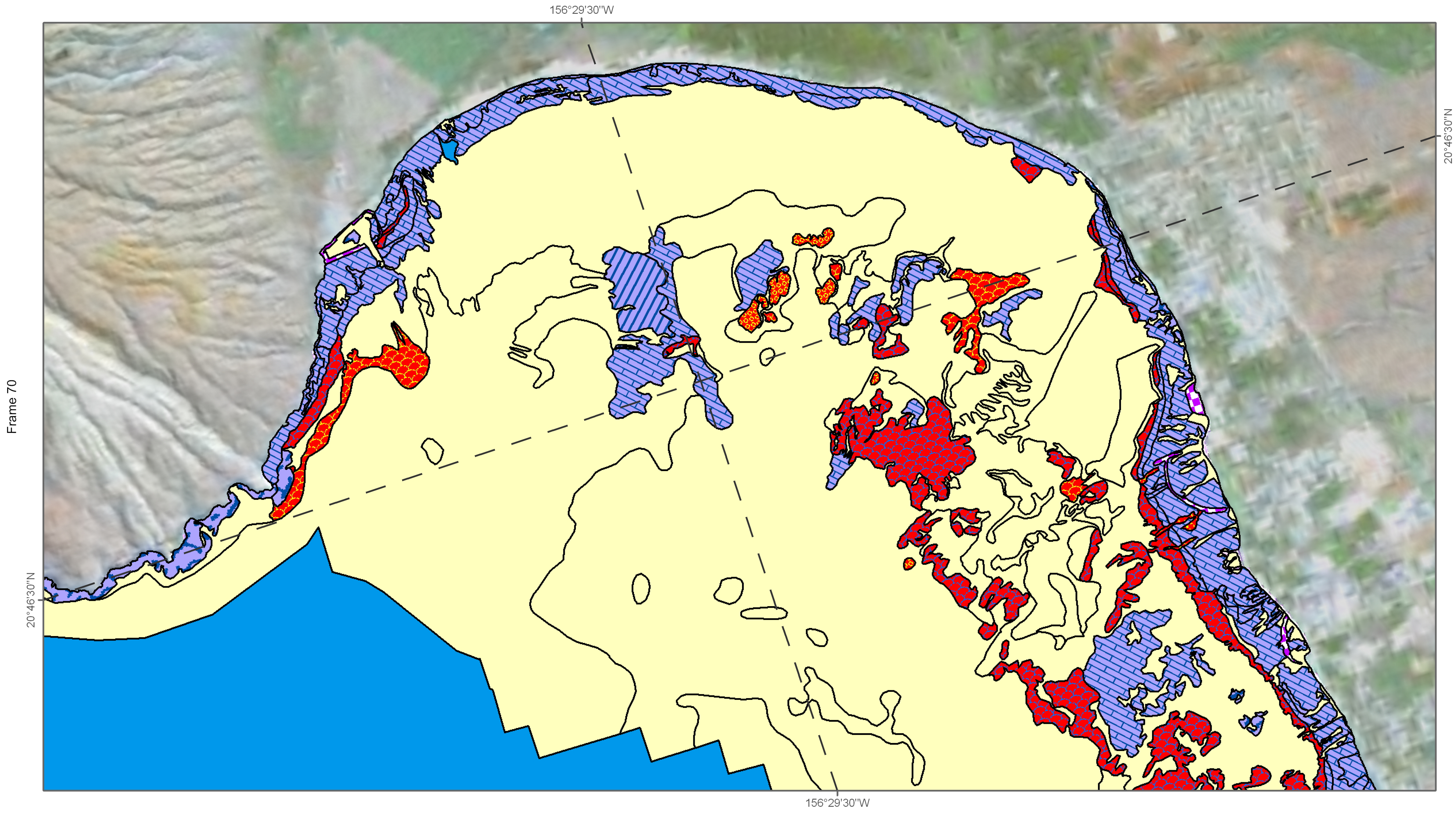
1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 69)


156°29'30"W
20°46'30"N
Frame 70
20°46'30"N
156°29'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
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0 5 10
km
Hawaii (Big Island)
N
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0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

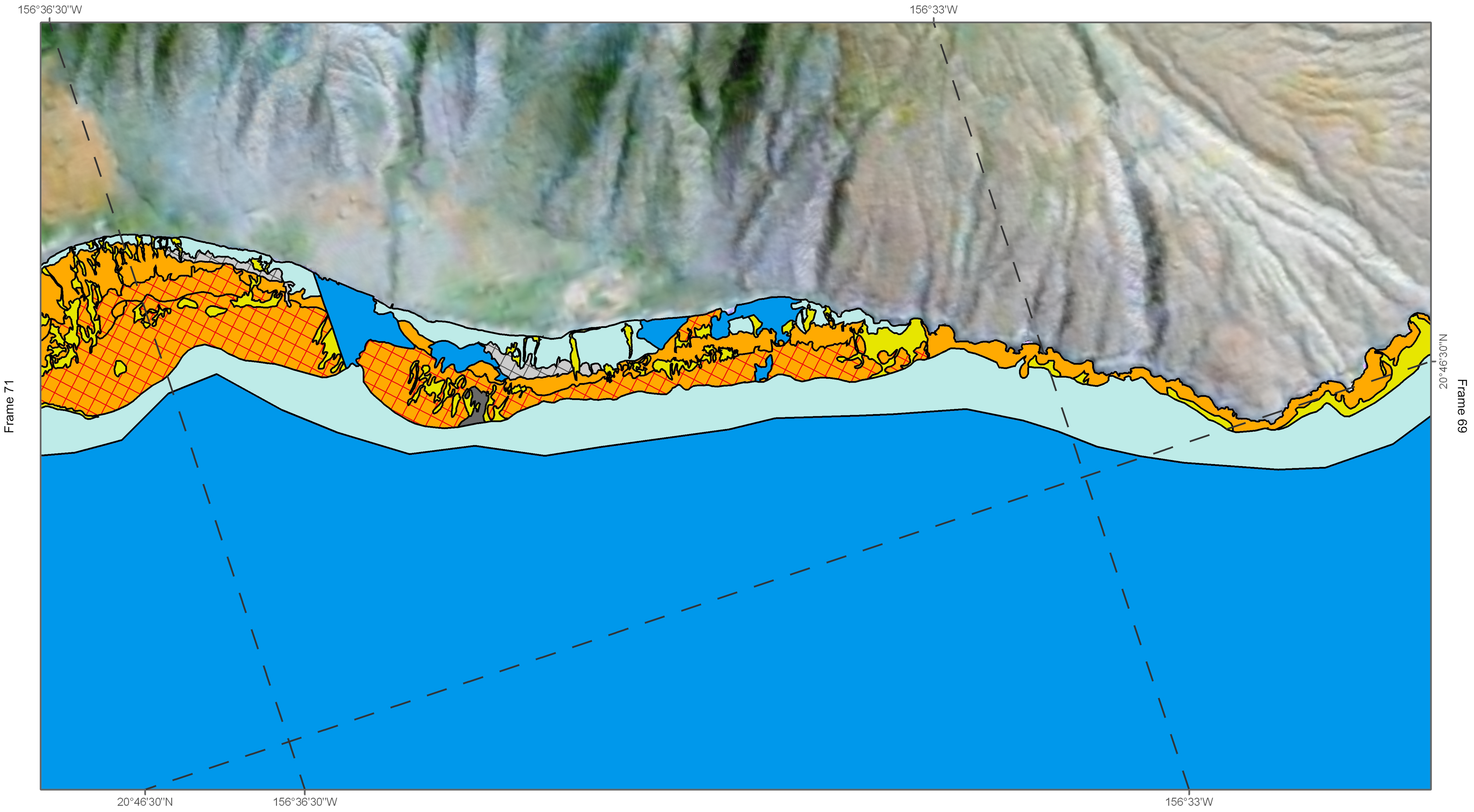
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 70)


156°36'30"W
156°33'W
Frame 71
Frame 69
20°46'30"N
20°46'30"N
156°36'30"W
156°33'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
0 5 10 km
0 50 100 km

Biological Cover Types

🟧 Coral 10%-<50%
▨ Coral 50%-<90%
🟥 Coral 90%-100%
▨ Seagrass 10%-<50%
▭ Macroalgae 10%-<50%
▨ Macroalgae 50%-<90%
■ Macroalgae 90%-100%
▭ Coralline Algae 10%-<50%
▨ Coralline Algae 50%-<90%
▭ Turf 10%-<50%
▨ Turf 50%-<90%
■ Turf 90%-100%
🟩 Emergent Vegetation 10%-<50%
▨ Emergent Vegetation 50%-<90%
■ Emergent Vegetation 90%-100%
■ Uncolonized 50%-<90%
🟨 Uncolonized 90%-100%
☐ Unclassified
🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

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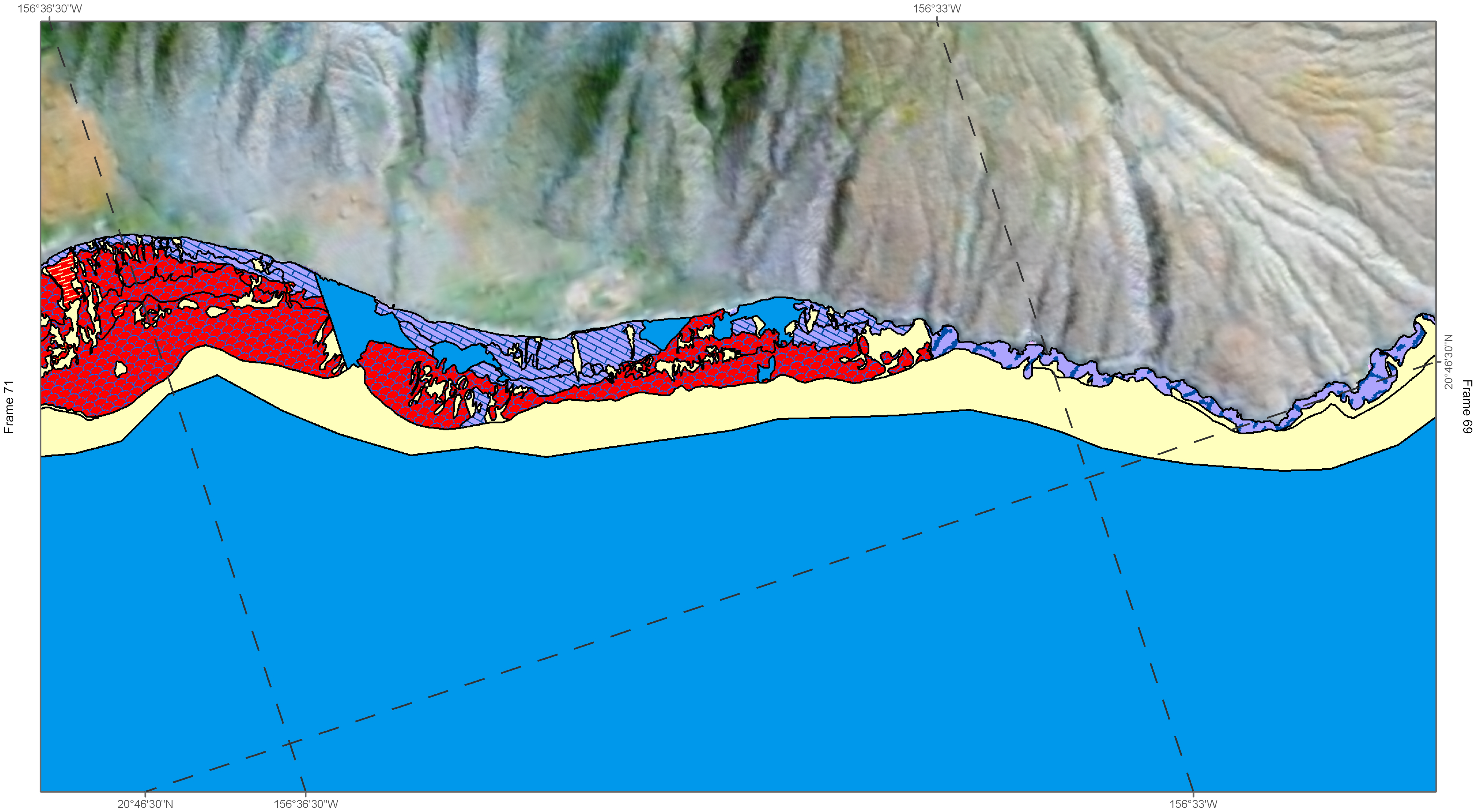
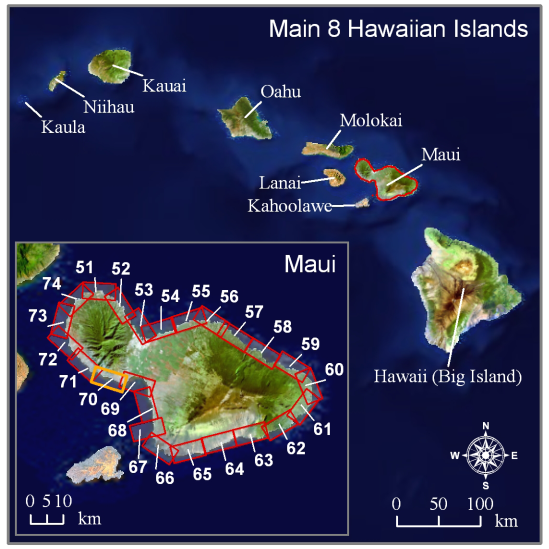
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 70)


156°36'30"W
156°33'W
Frame 71
20°46'30"N
Frame 69
20°46'30"N
156°36'30"W
156°33'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
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Hawaii (Big Island)
0 5 10
km
0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

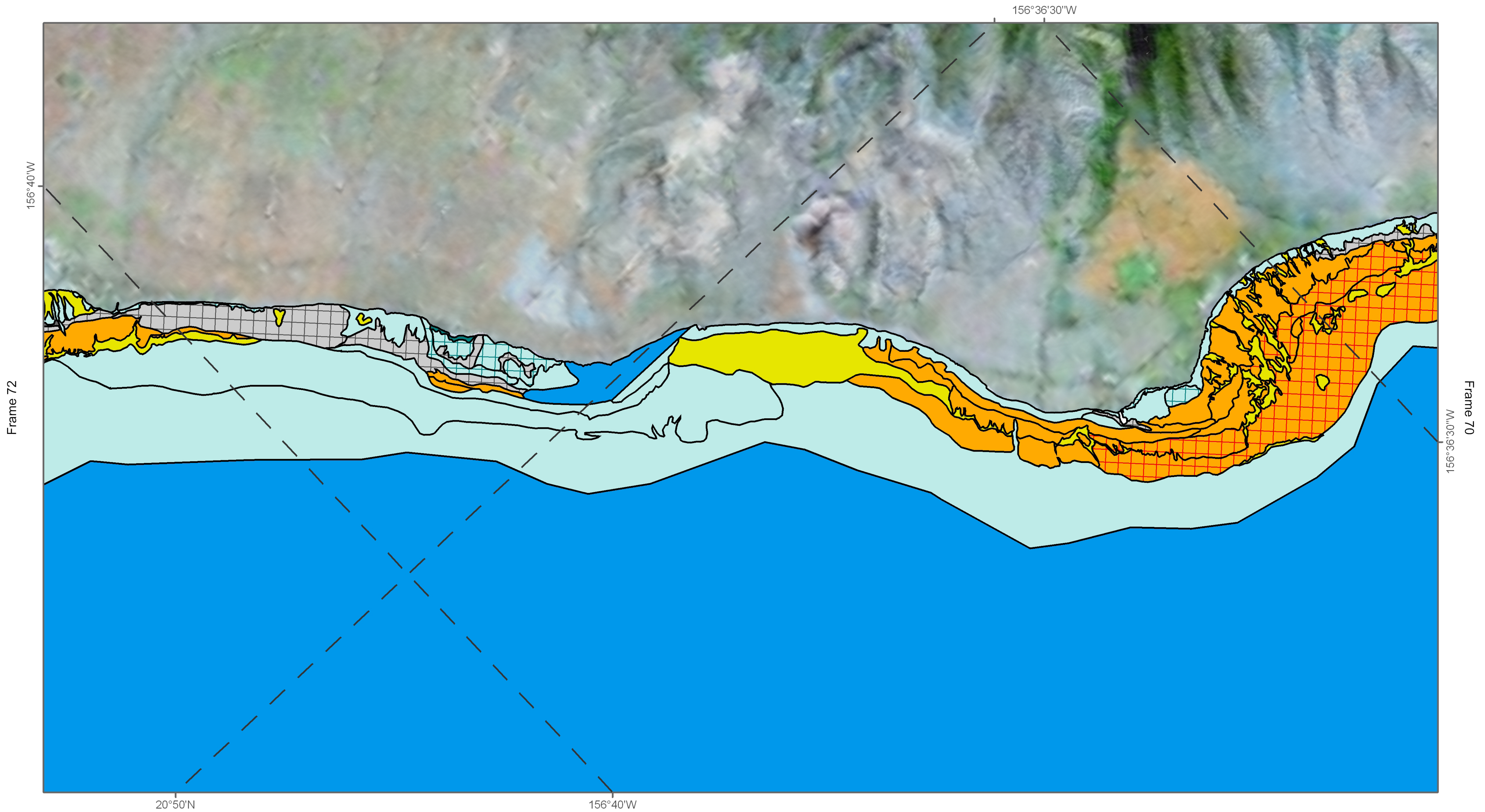
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

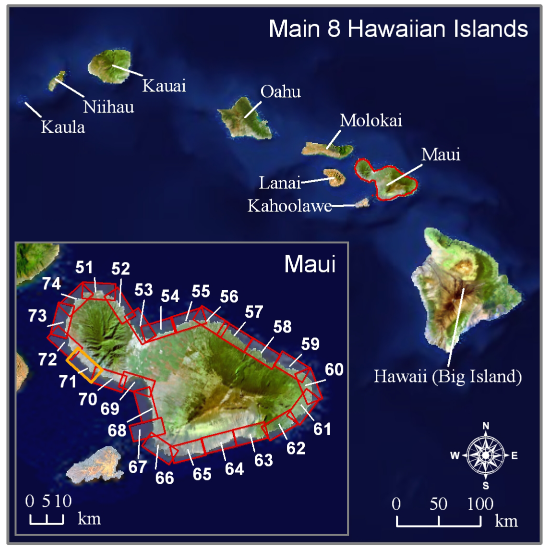
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 71)



156°36'30"W
156°40'W
Frame 72
Frame 70
156°39'30"W
20°50'N
156°40'W



Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- ■ Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- ■ Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

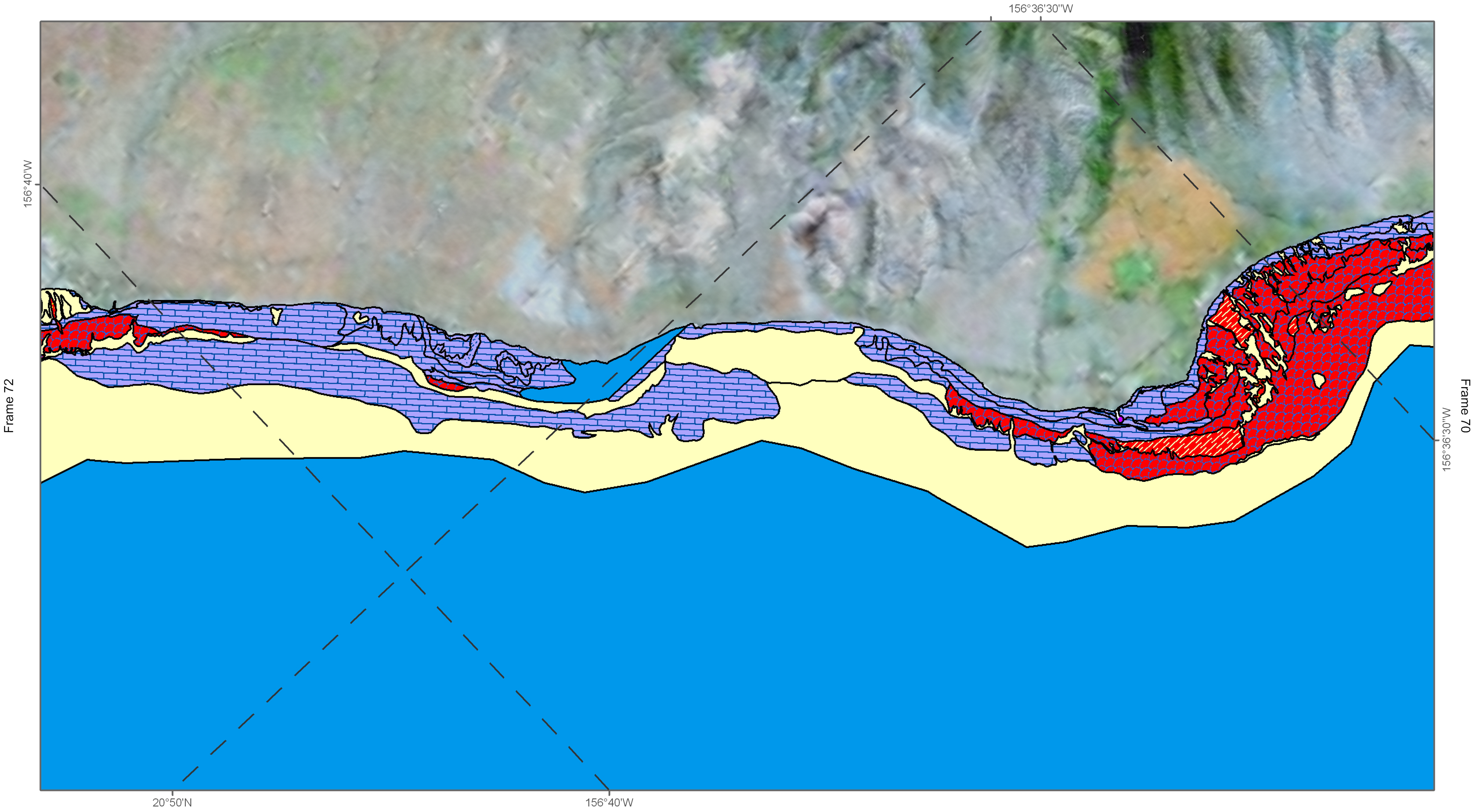
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 71)


156°36'30"W
156°40'W
Frame 72
Frame 70
156°36'30"W
20°50'N
156°40'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
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Geomorphological Structure Types

▨ Aggregate Reef
▨ Aggregated Patch Reef
▨ Individual Patch Reef
▨ Scattered Coral/Rock
▨ Spur and Groove
▨ Pavement
▨ Pavement with Sand Channels
▨ Rock/Boulder
▨ Rubble
▨ Artificial
▨ Mud
▨ Sand
▨ Unknown

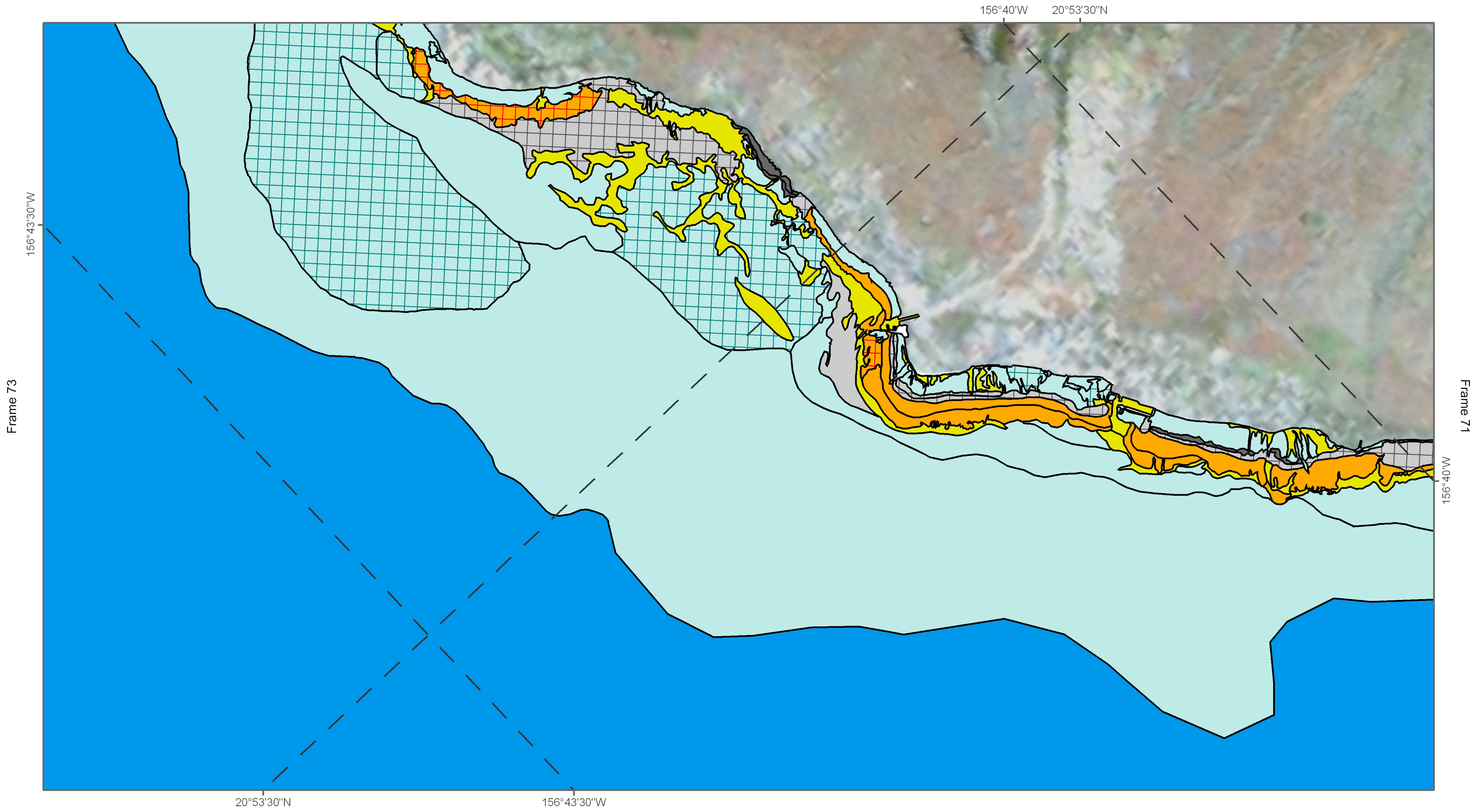
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

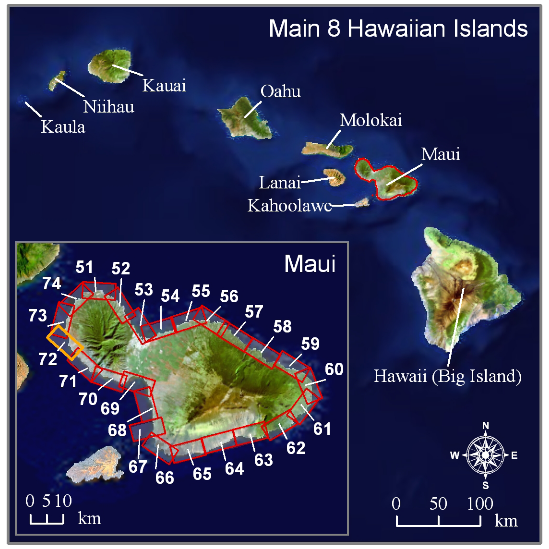
Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 72)


156°40'W
20°53'30"N
156°43'30"W
Frame 73
Frame 71
156°40'W
20°53'30"N
156°43'30"W

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Maui
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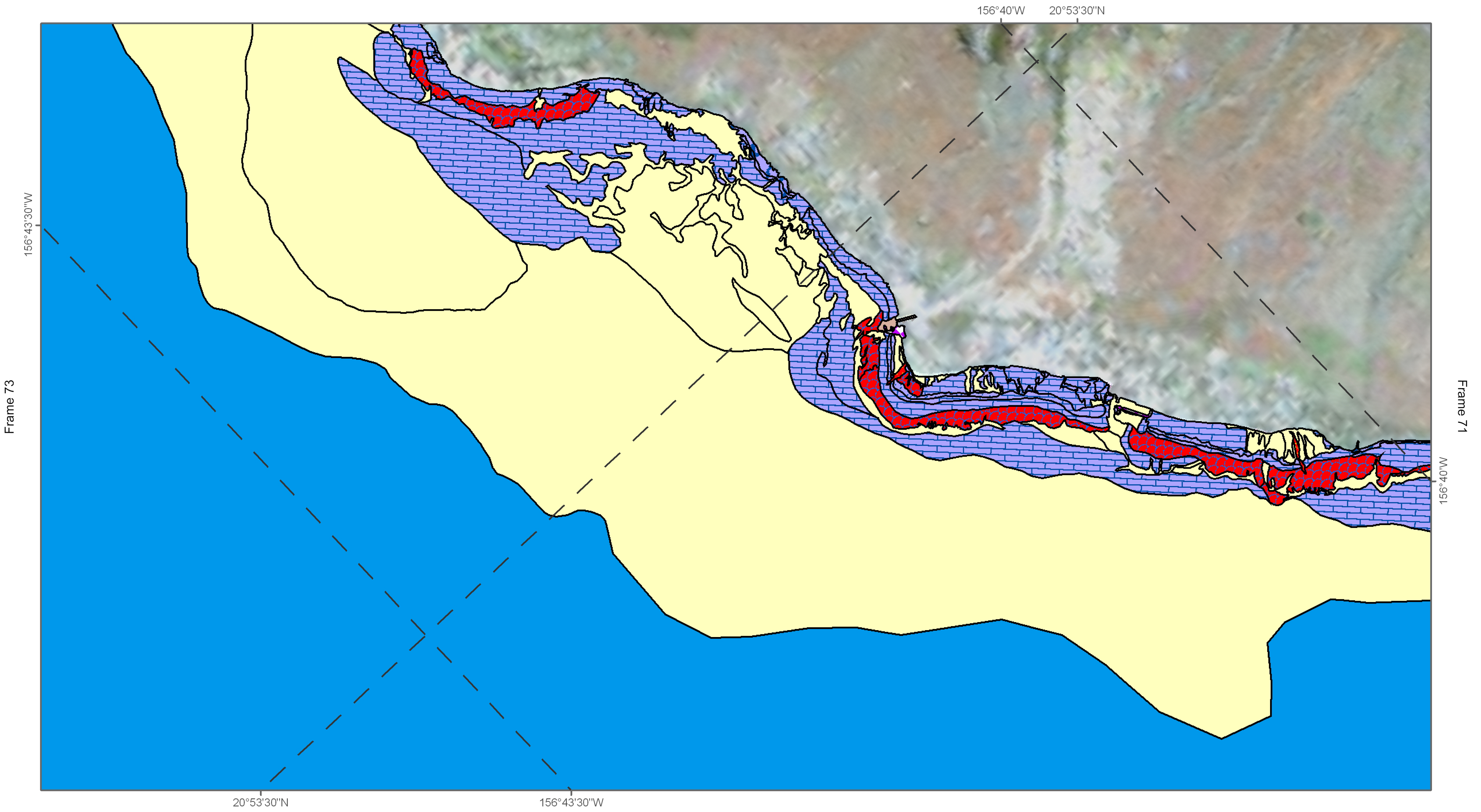
Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 72)


156°40'W
20°53'30"N
156°43'30"W
Frame 73
Frame 71
156°40'W
20°53'30"N
156°43'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
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Hawaii (Big Island)
0 5 10
km
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Geomorphological Structure Types

- Aggregate Reef
- Aggregated Patch Reef
- Individual Patch Reef
- Scattered Coral/Rock
- Spur and Groove
- Pavement
- Pavement with Sand Channels
- Rock/Boulder
- Rubble
- Artificial
- Mud
- Sand
- Unknown

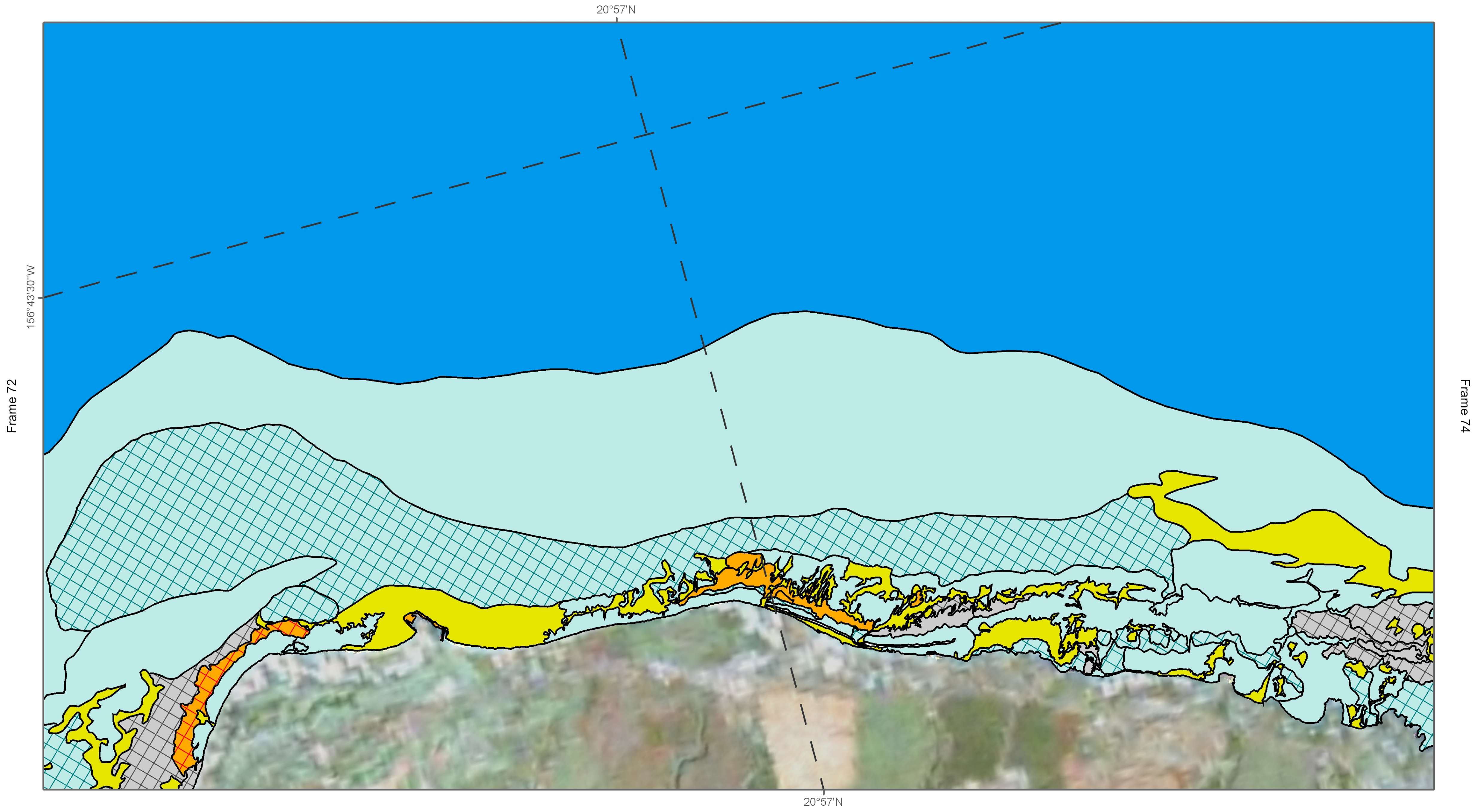
□ Minimum Mapping Unit (1 Acre)

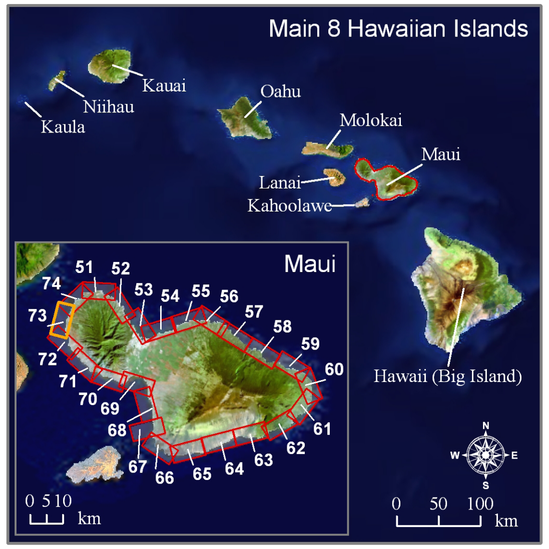
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 73)


20°57'N
156°43'30"W
Frame 72
Frame 74
20°57'N


Main 8 Hawaiian Islands
Kauai
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Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
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0 5 10
km
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▨ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▨ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▨ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

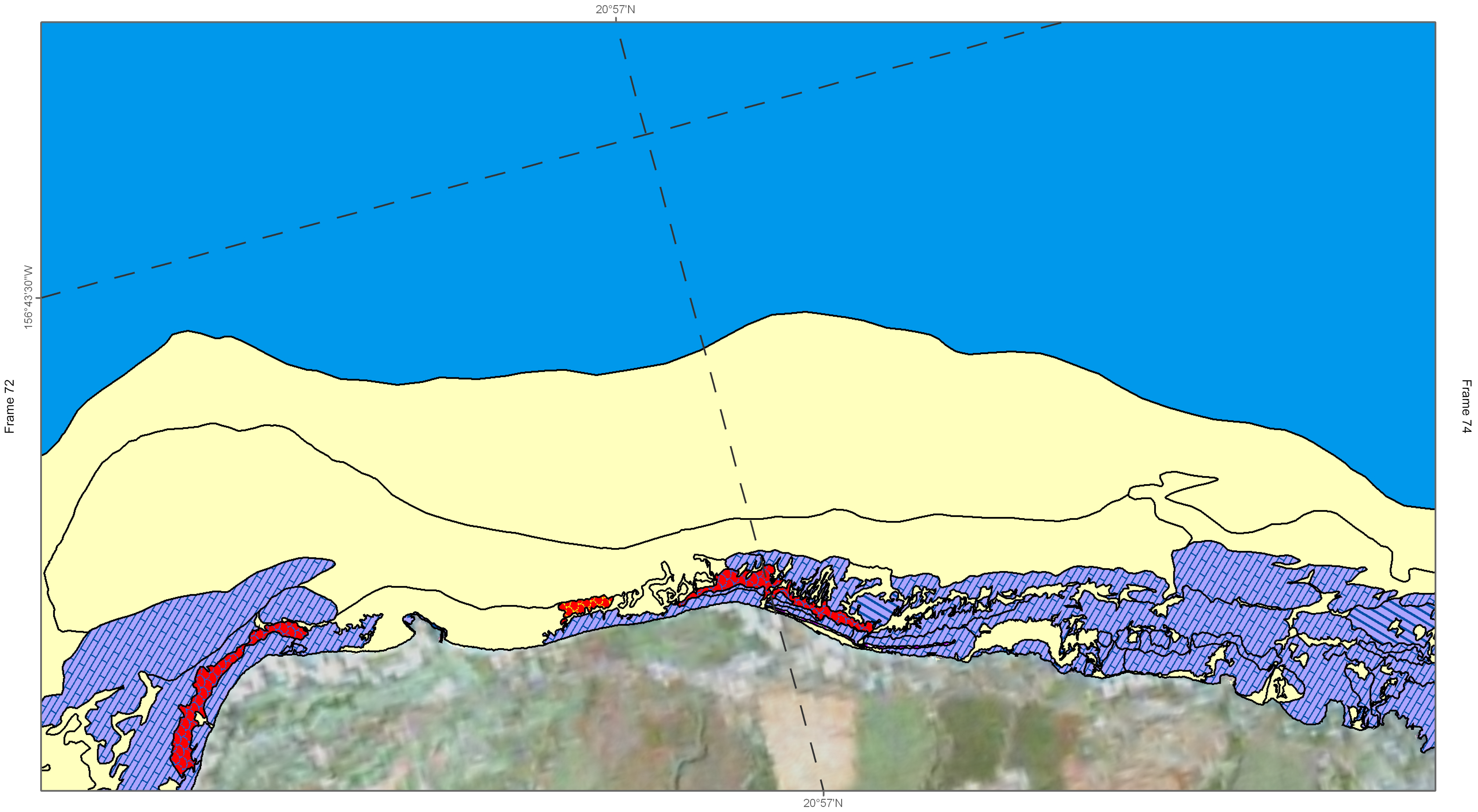
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 73)


20°57'N
156°43'30"W
Frame 72
Frame 74
20°57'N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
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0 5 10
km
Hawaii (Big Island)
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0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- ⬜ Sand
- 🟦 Unknown

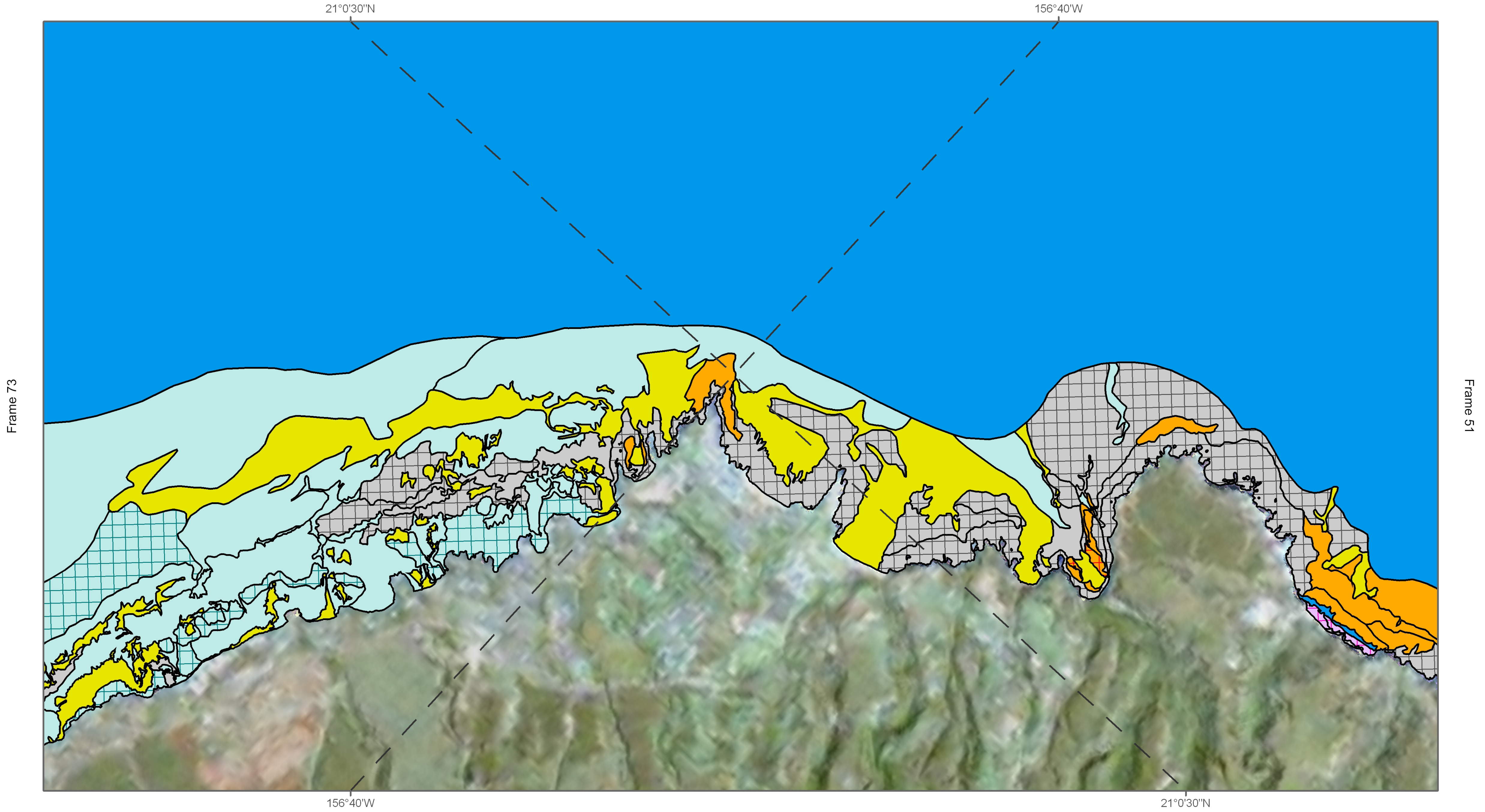
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

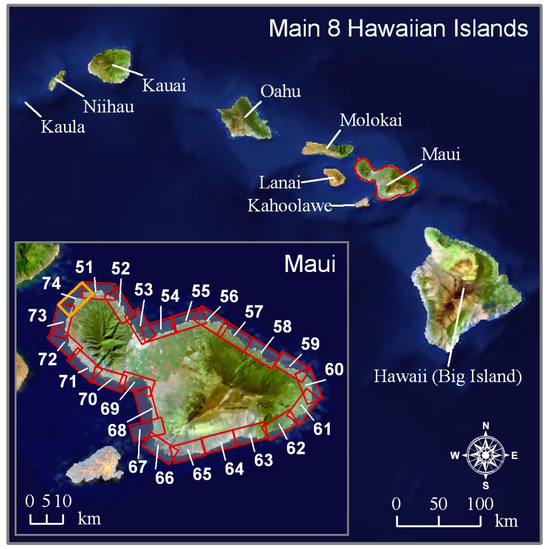
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 74)


21°0'30"N
156°40'W
Frame 73
Frame 51
156°40'W
21°0'30"N

0 0.5 1 1.5 km


Main 8 Hawaiian Islands
Kauai
Oahu
Niihau
Kaula
Molokai
Maui
Lanai
Kahoolawe
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Hawaii (Big Island)
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0 5 10
km
0 50 100
km

Biological Cover Types

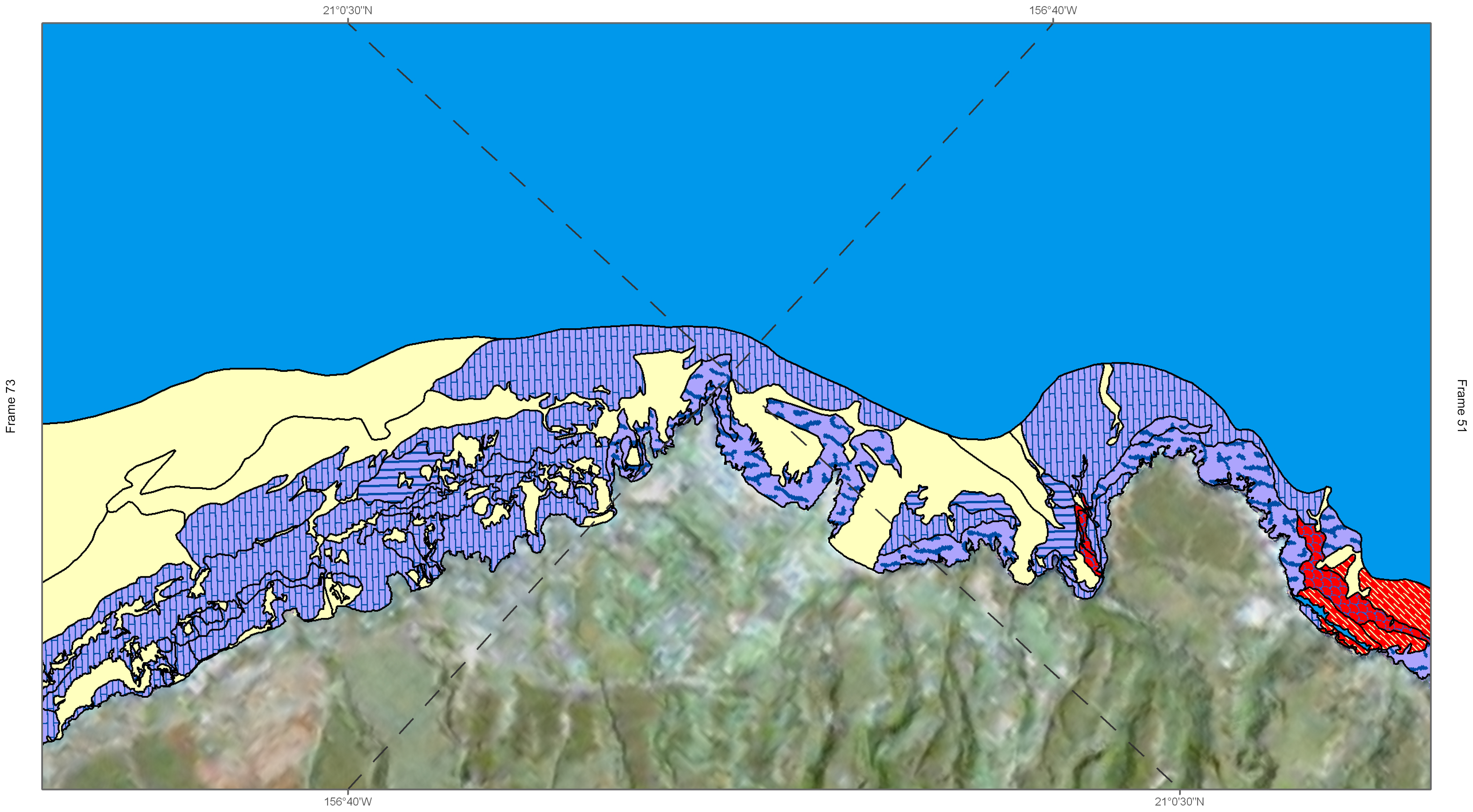
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟨 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

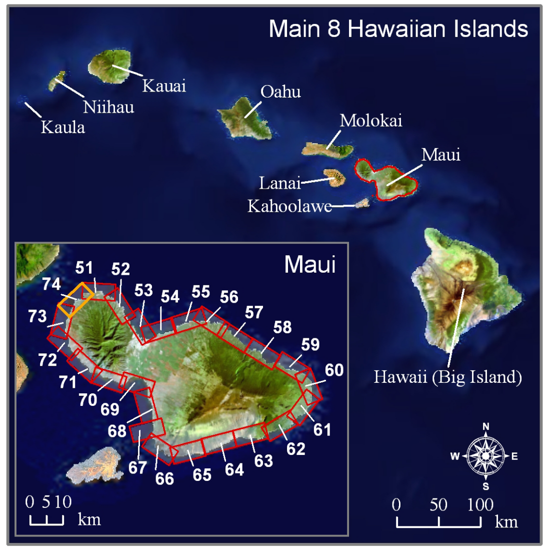
□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Maui) : Shallow-water Benthic Habitats (Frame 74)


21°0'30"N
156°40'W
Frame 73
Frame 51
156°40'W
21°0'30"N
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Maui
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74
Hawaii (Big Island)
0 5 10 km
0 50 100 km
N
W
E
S

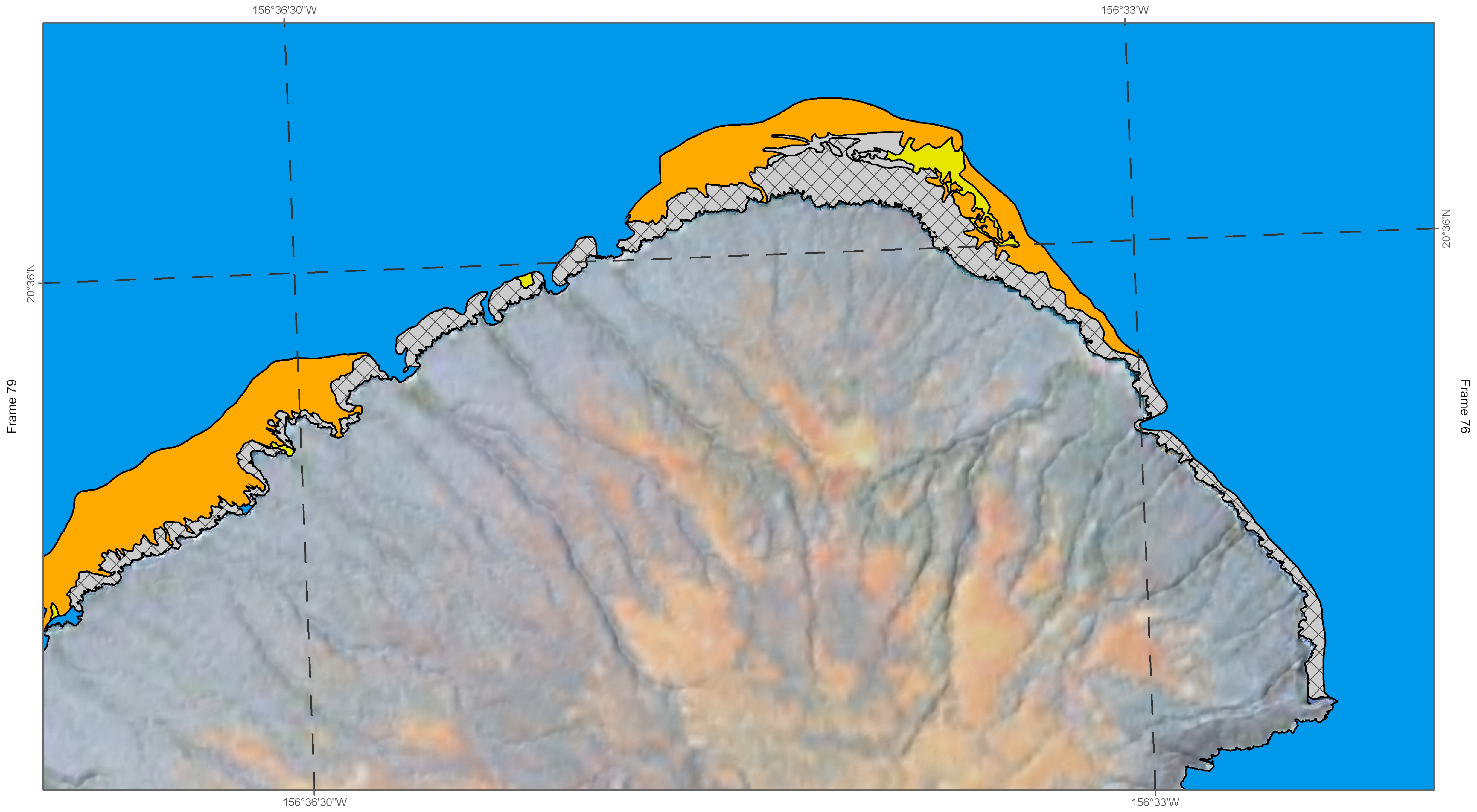
Geomorphological Structure Types

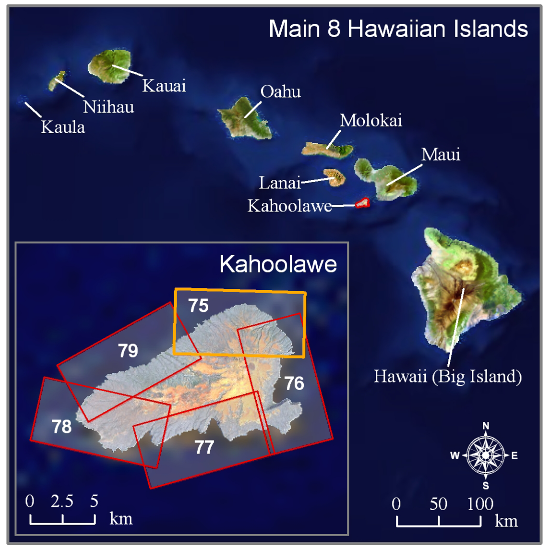
- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Kahoolawe) : Shallow-water Benthic Habitats (Frame 75)


156°36'30"W
156°33'W
20°36'N
20°36'N
Frame 79
Frame 76
156°36'30"W
156°33'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kahoolawe
75
79
76
78
77
0 2.5 5
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ☐ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ☐ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ☐ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

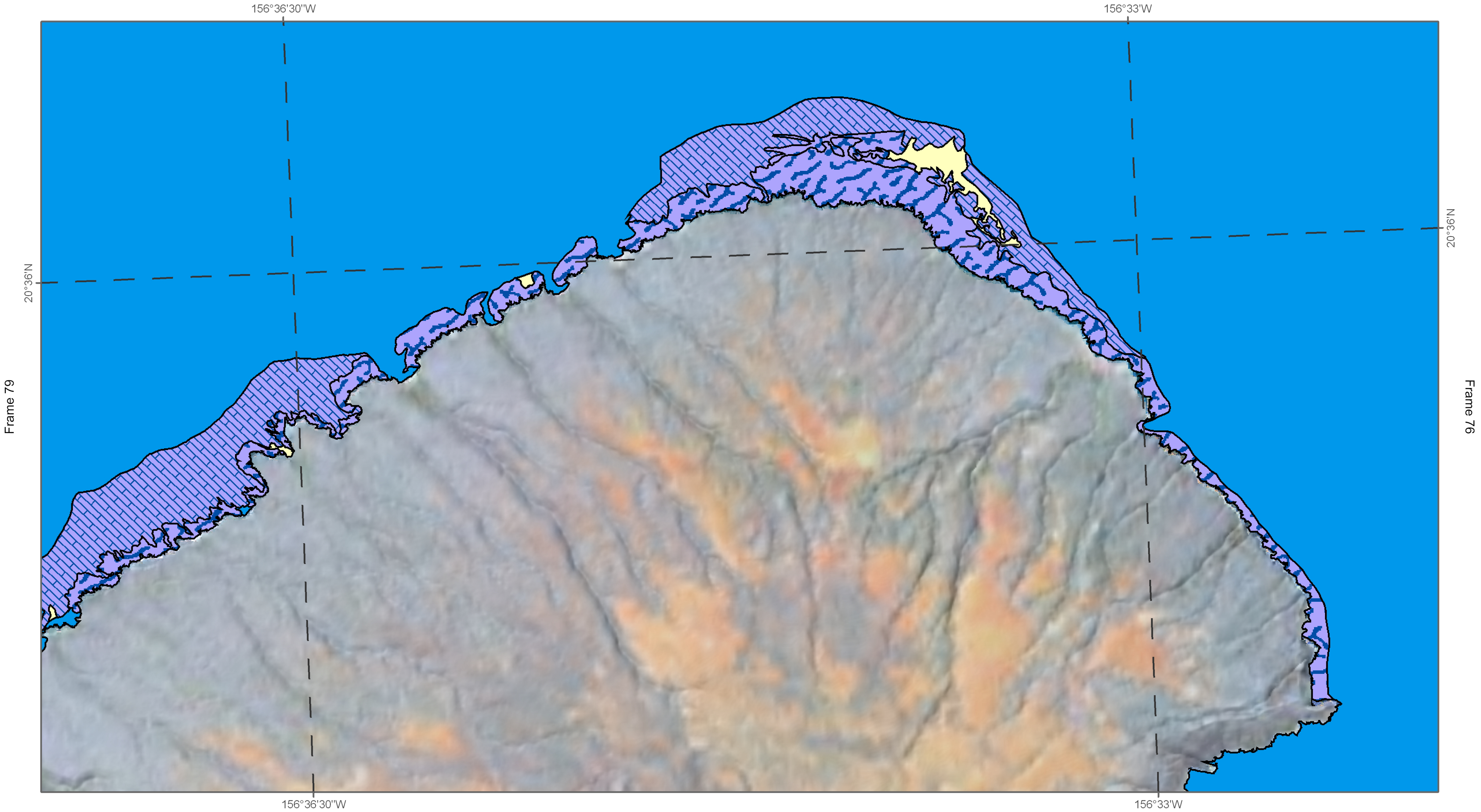
□ Minimum Mapping Unit (1 Acre)

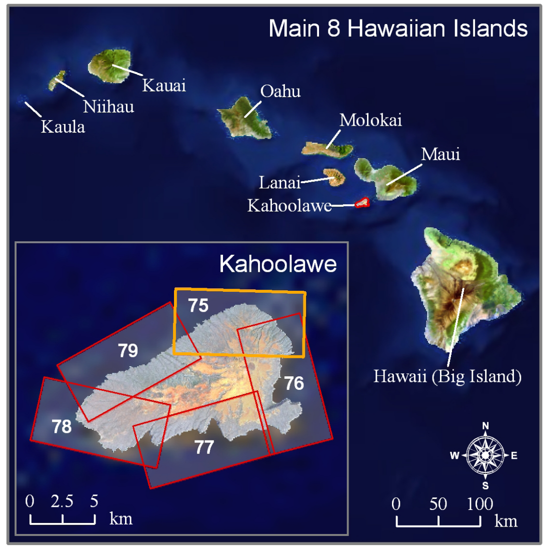
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Kahoolawe) : Shallow-water Benthic Habitats (Frame 75)


156°36'30"W
156°33'W
20°36'N
20°36'N
Frame 79
Frame 76
156°36'30"W
156°33'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kahoolawe
75
79
76
78
77
0 2.5 5 km
N
W
E
S
0 50 100 km

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

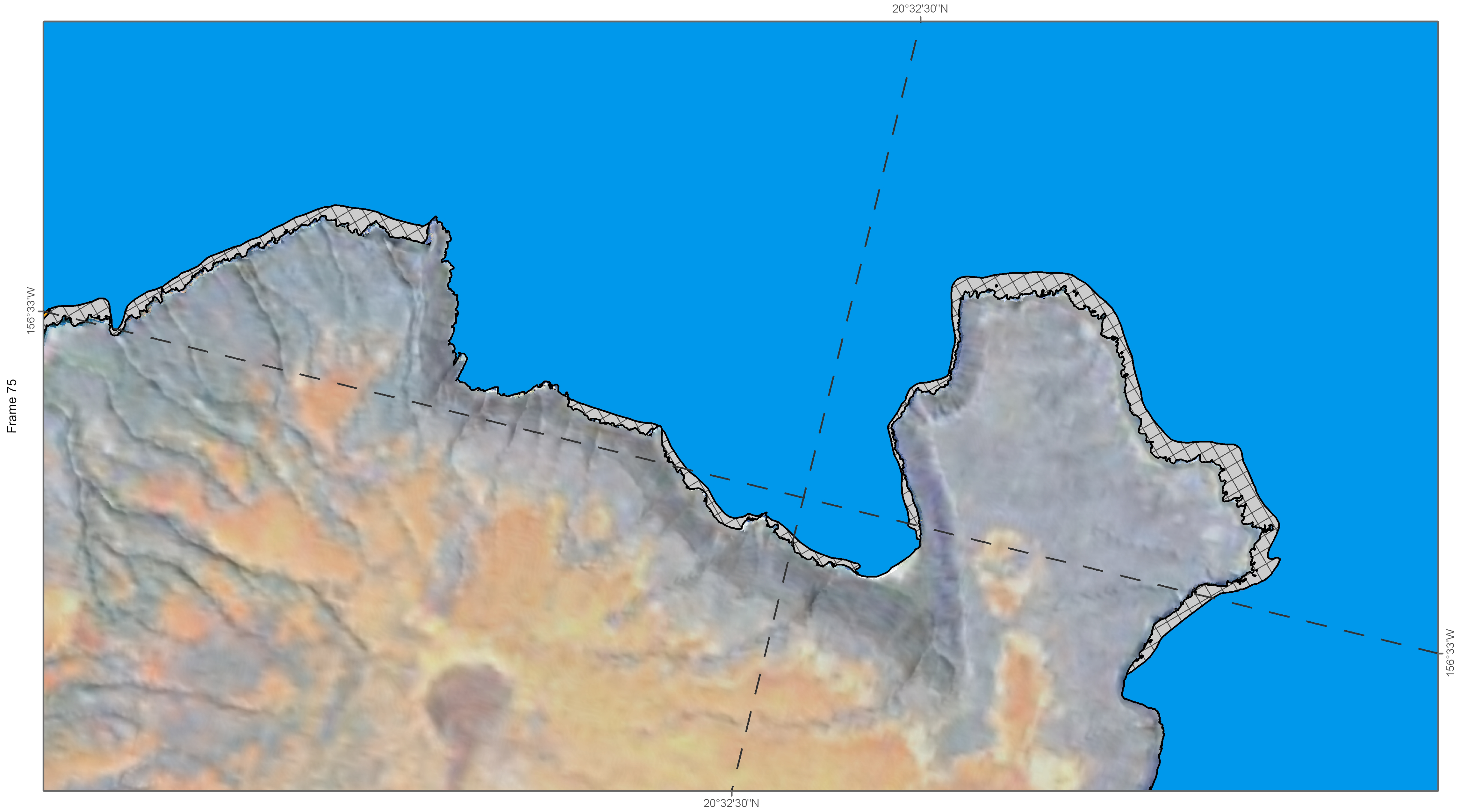
☐ Minimum Mapping Unit (1 Acre)

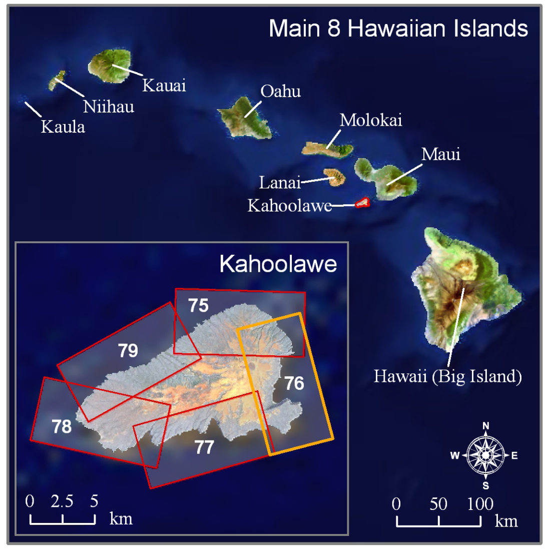
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Kahoolawe) : Shallow-water Benthic Habitats (Frame 76)


20°32'30"N
156°33'W
Frame 75
156°33'W
20°32'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Kahoolawe
75
79
76
78
77
0 2.5 5
km
Hawaii (Big Island)
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

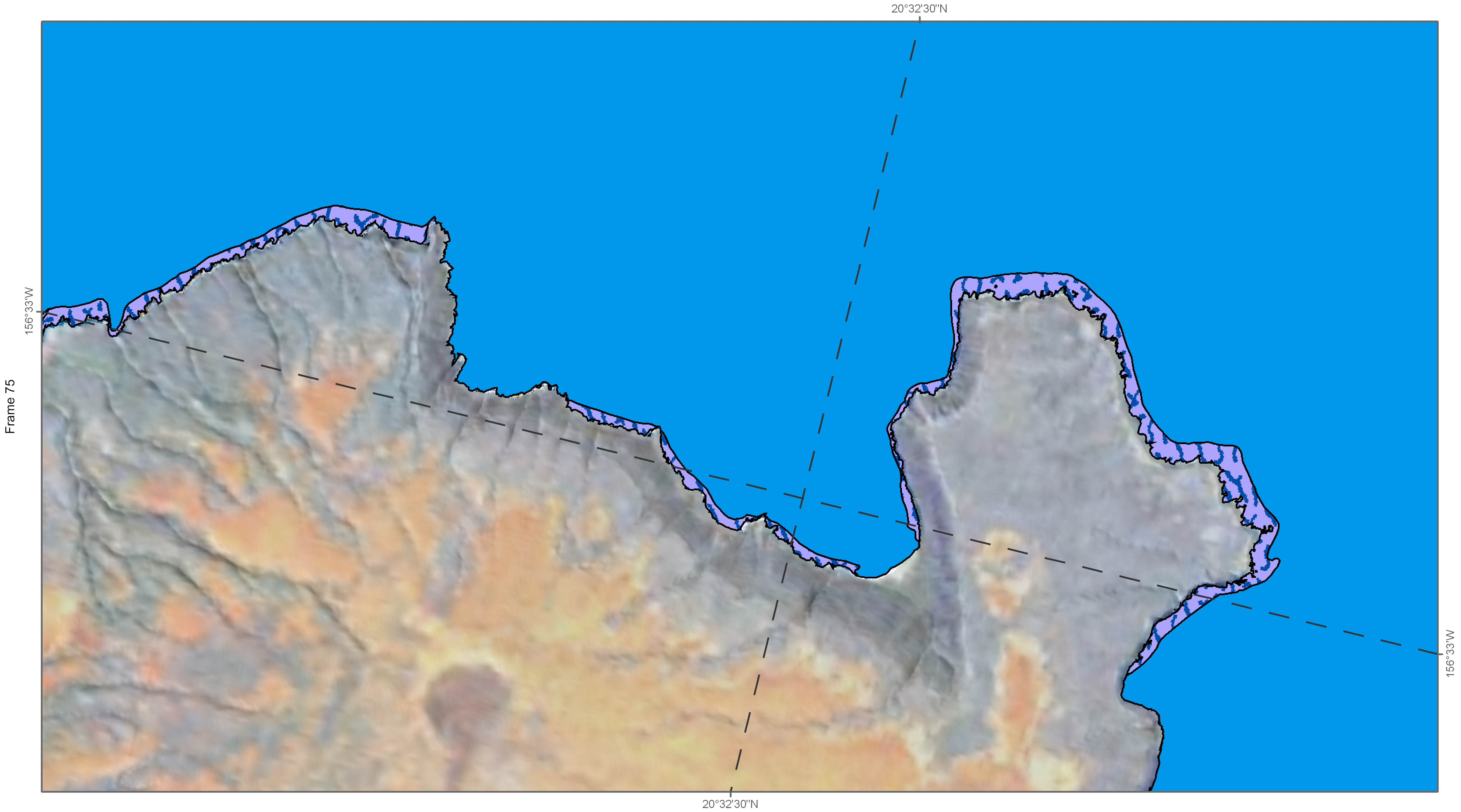
□ Minimum Mapping Unit (1 Acre)

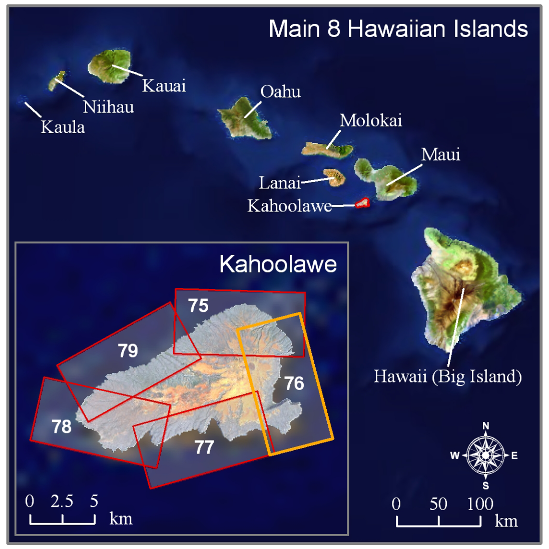
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Kahoolawe) : Shallow-water Benthic Habitats (Frame 76)


20°32'30"N
156°33'W
Frame 75
156°33'W
20°32'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kahoolawe
75
79
76
78
77
0 2.5 5
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

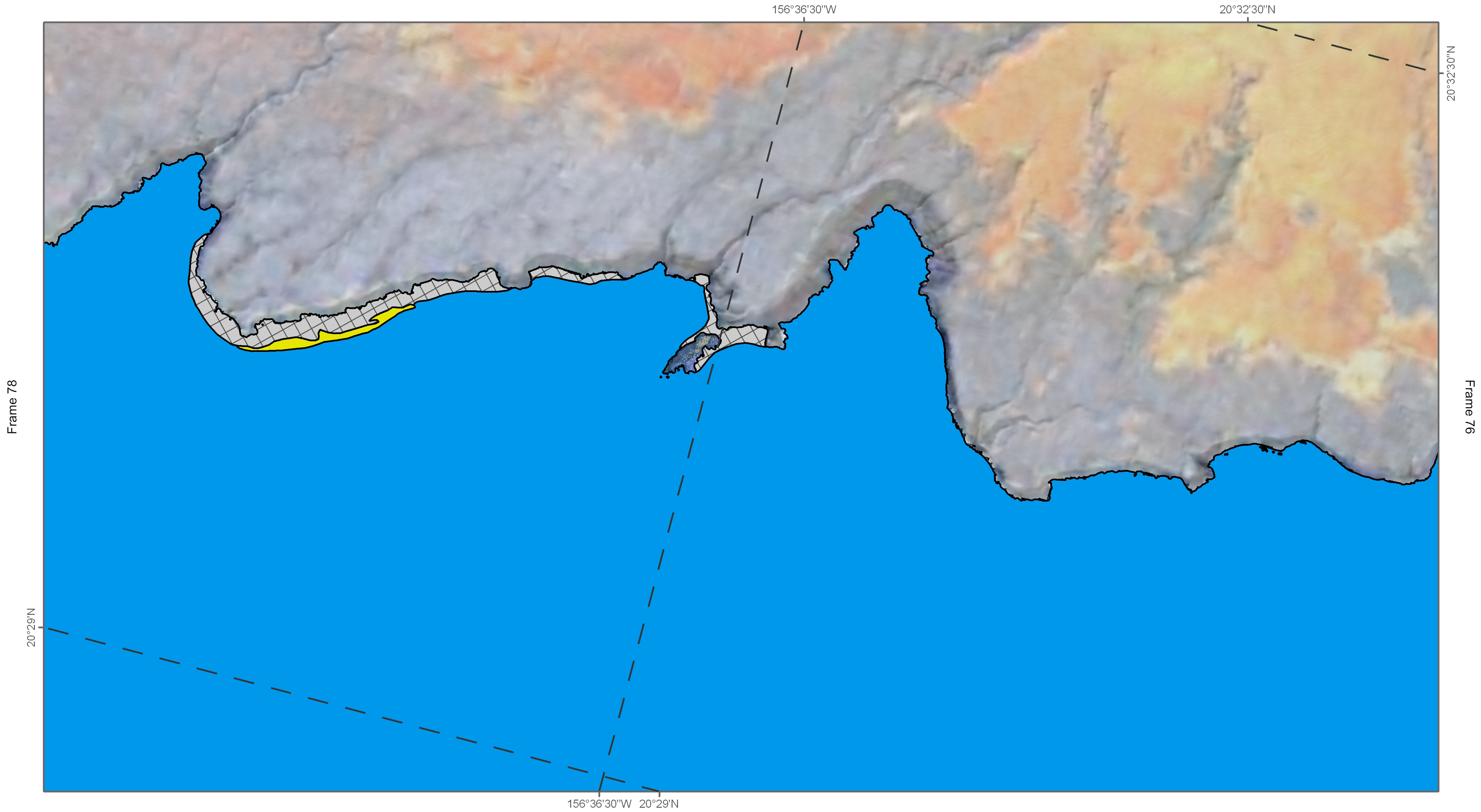
□ Minimum Mapping Unit (1 Acre)

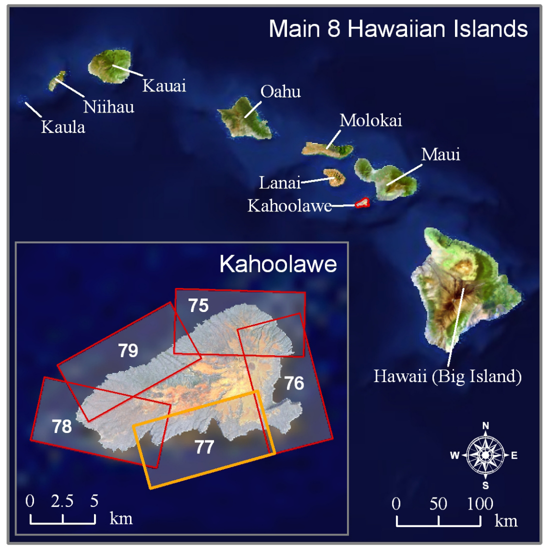
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kahoolawe) : Shallow-water Benthic Habitats (Frame 77)


156°36'30"W
20°32'30"N
20°32'30"N
Frame 78
Frame 76
20°29'N
156°36'30"W
20°29'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Kahoolawe
75
79
76
78
77
0 2.5 5
km
Hawaii (Big Island)
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

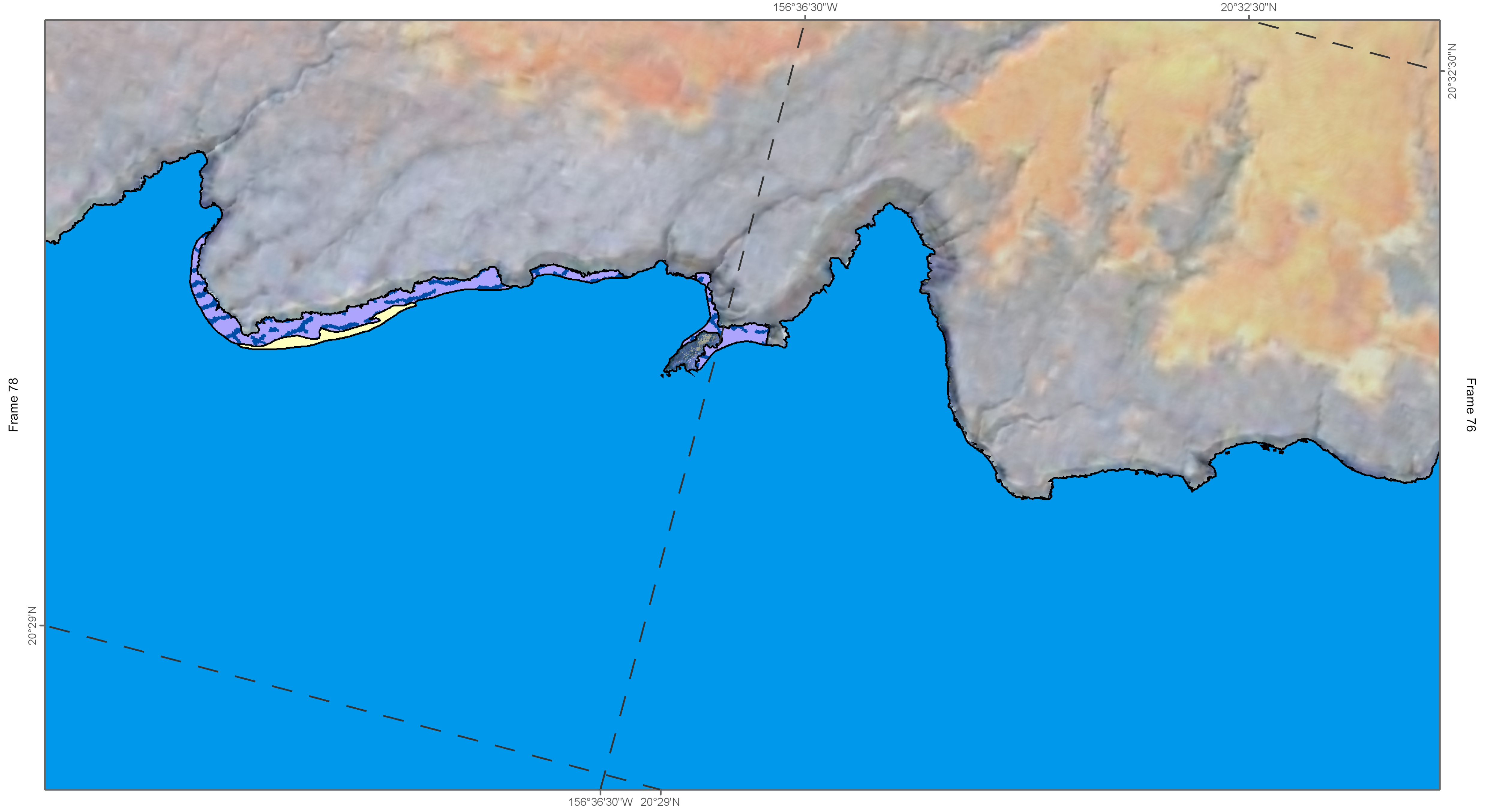
□ Minimum Mapping Unit (1 Acre)

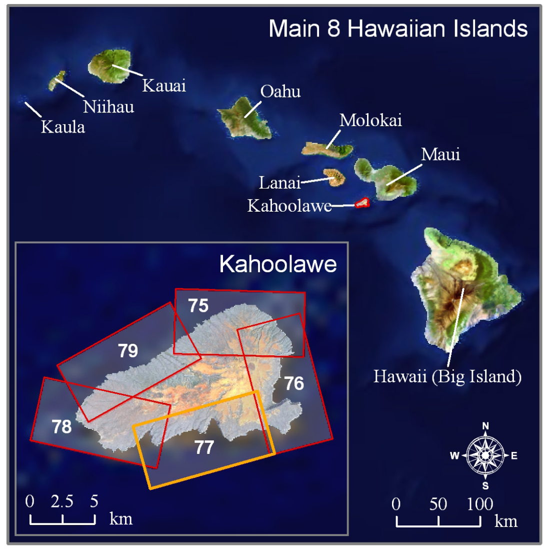
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Kahoolawe) : Shallow-water Benthic Habitats (Frame 77)


156°36'30"W
20°32'30"N
20°32'30"N
Frame 78
Frame 76
20°29'N
156°36'30"W 20°29'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Kahoolawe
75
79
76
78
77
0 2.5 5
km
Hawaii (Big Island)
N
W
E
S
0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

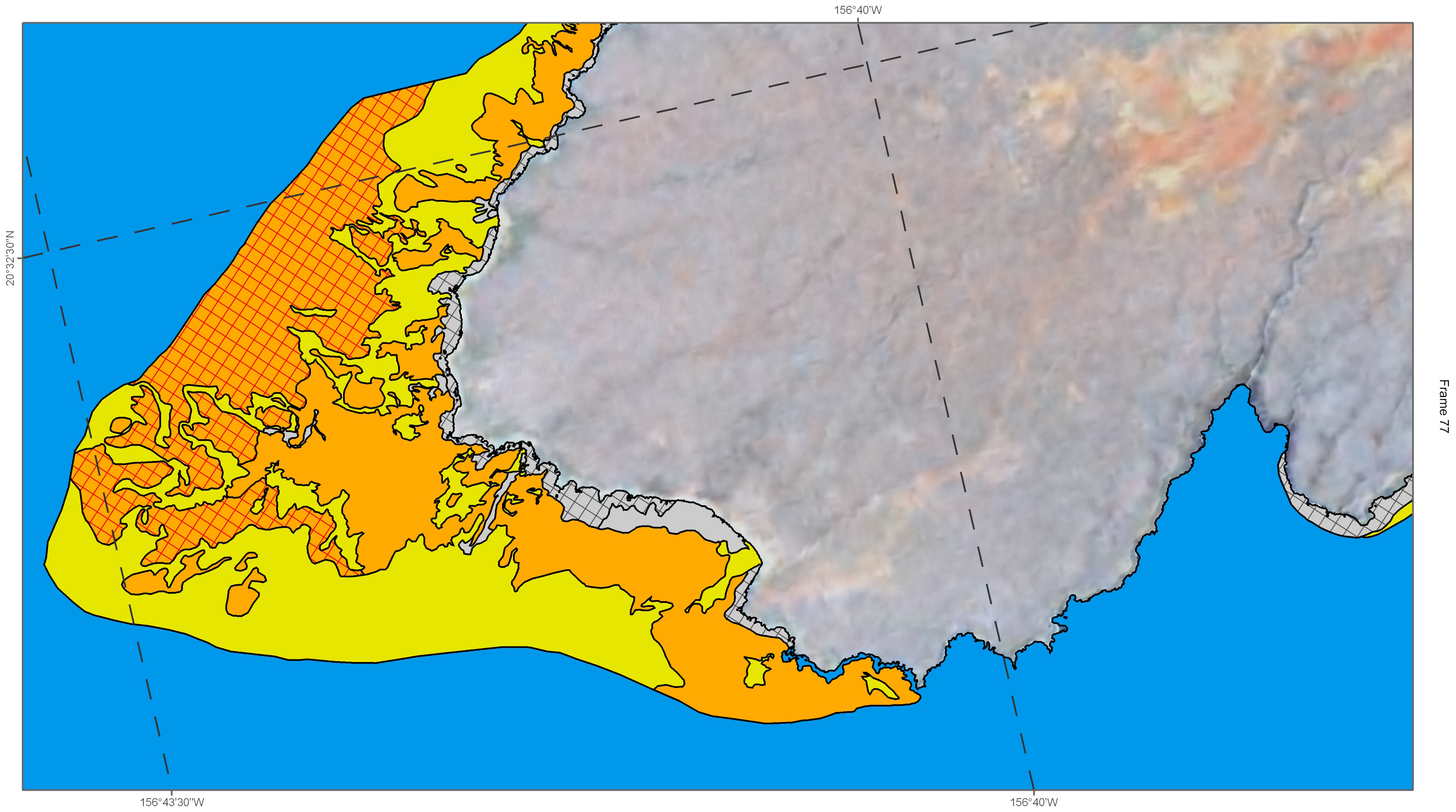
☐ Minimum Mapping Unit (1 Acre)

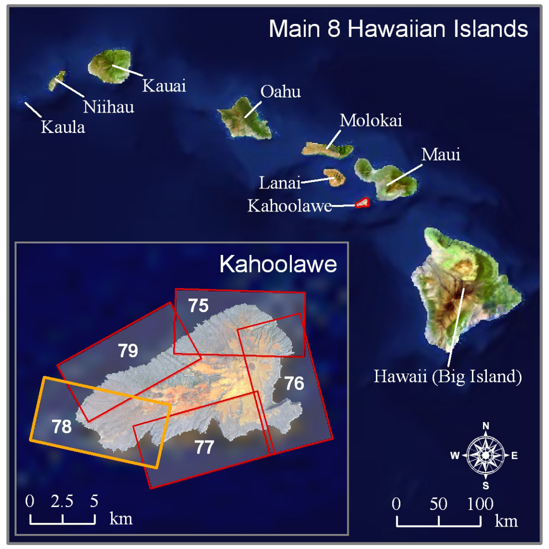
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kahoolawe) : Shallow-water Benthic Habitats (Frame 78)


156°40'W
20°32'30"N
Frame 77
156°43'30"W
156°40'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kahoolawe
75
79
76
78
77
0 2.5 5
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

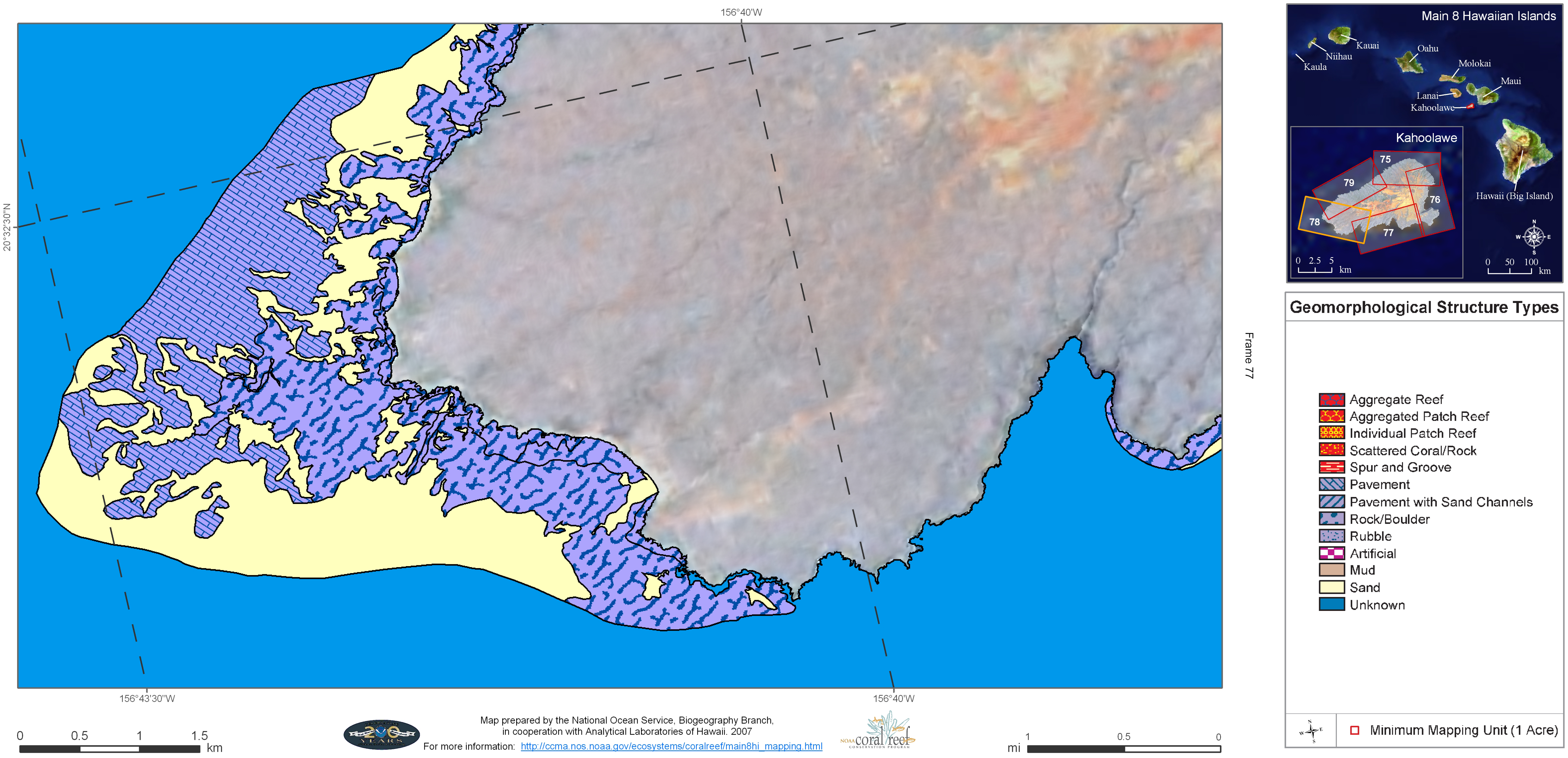
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

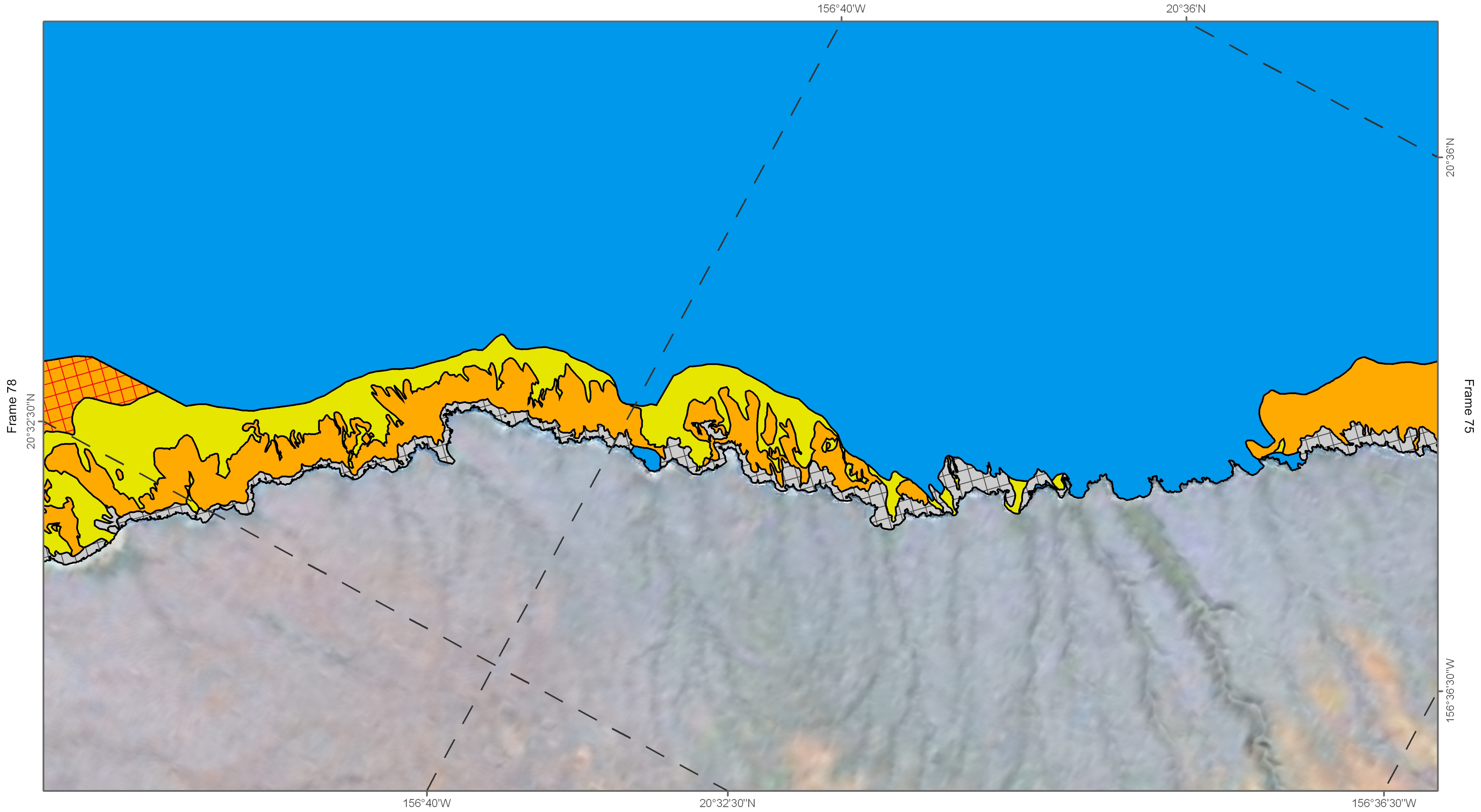
mi 1 0.5 0

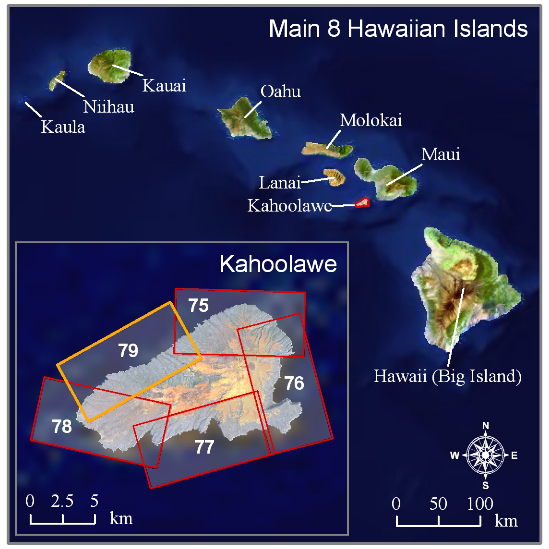
Main 8 Hawaiian Islands (Kahoolawe) : Shallow-water Benthic Habitats (Frame 78)


156°40'W
20°32'30"N
156°43'30"W
156°40'W
Frame 77
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Kahoolawe
75
79
76
78
77
0 2.5 5 km
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)
0 0.5 1 1.5 km
1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Kahoolawe) : Shallow-water Benthic Habitats (Frame 79)


156°40'W
20°36'N
20°36'N
Frame 78
20°32'30"N
Frame 75
156°36'30"W
156°40'W
20°32'30"N
156°36'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kahoolawe
75
79
76
78
77
0 2.5 5
km
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ☐ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ☐ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ☐ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

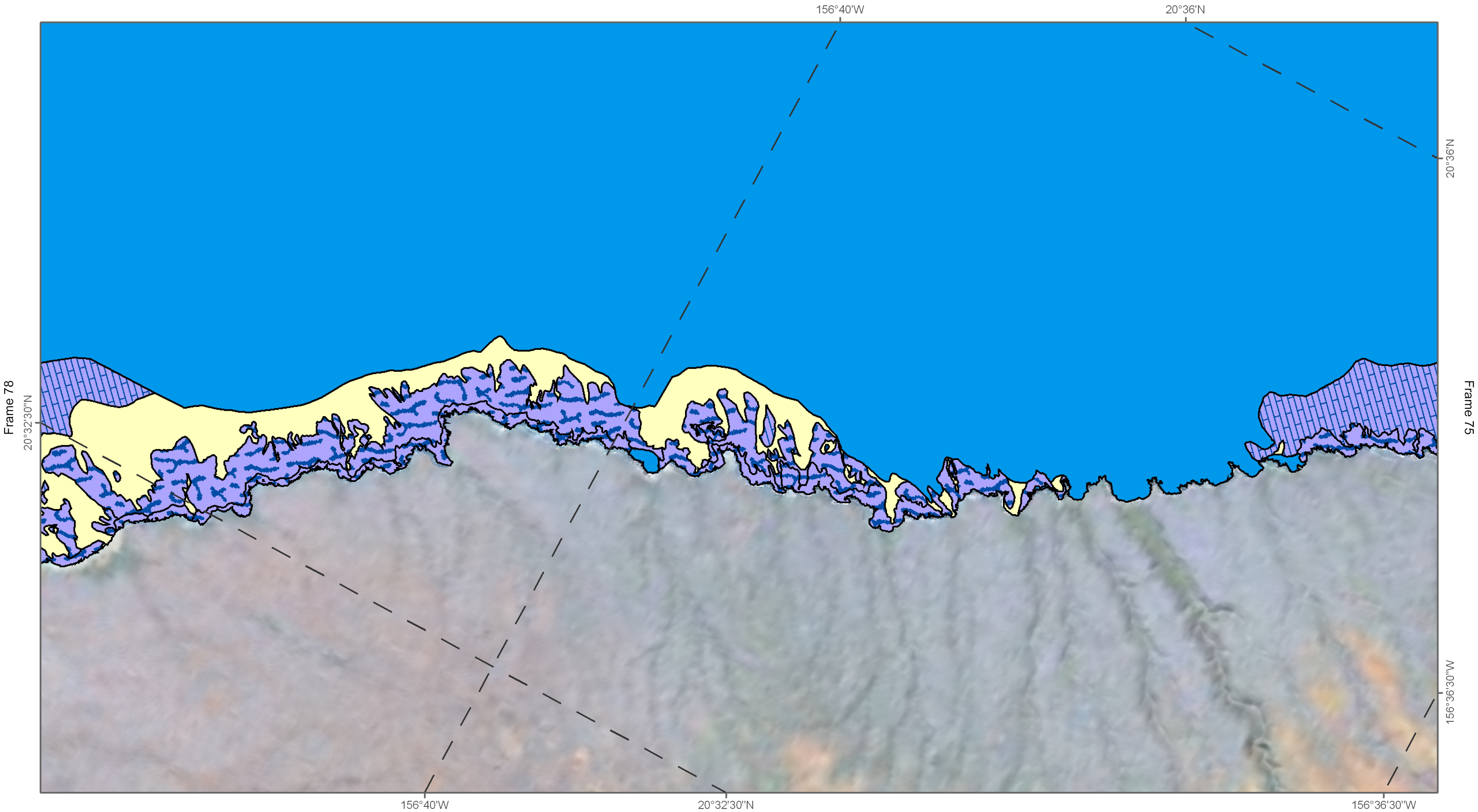
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

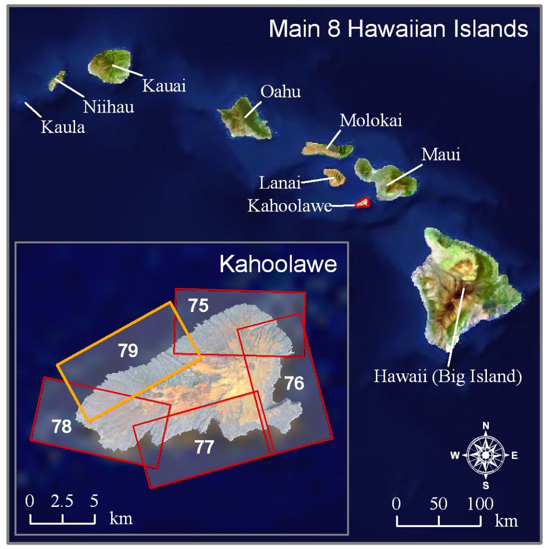
Main 8 Hawaiian Islands (Kahoolawe) : Shallow-water Benthic Habitats (Frame 79)



156°40'W
20°36'N
20°36'N
Frame 78
20°32'30"N
Frame 75
156°36'30"W
156°40'W
20°32'30"N
156°36'30"W

0 0.5 1 1.5 km

1 0.5 0 mi



Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Kahoolawe
75
79
76
78
77
0 2.5 5 km
Hawaii (Big Island)
N
W
E
S
0 50 100 km

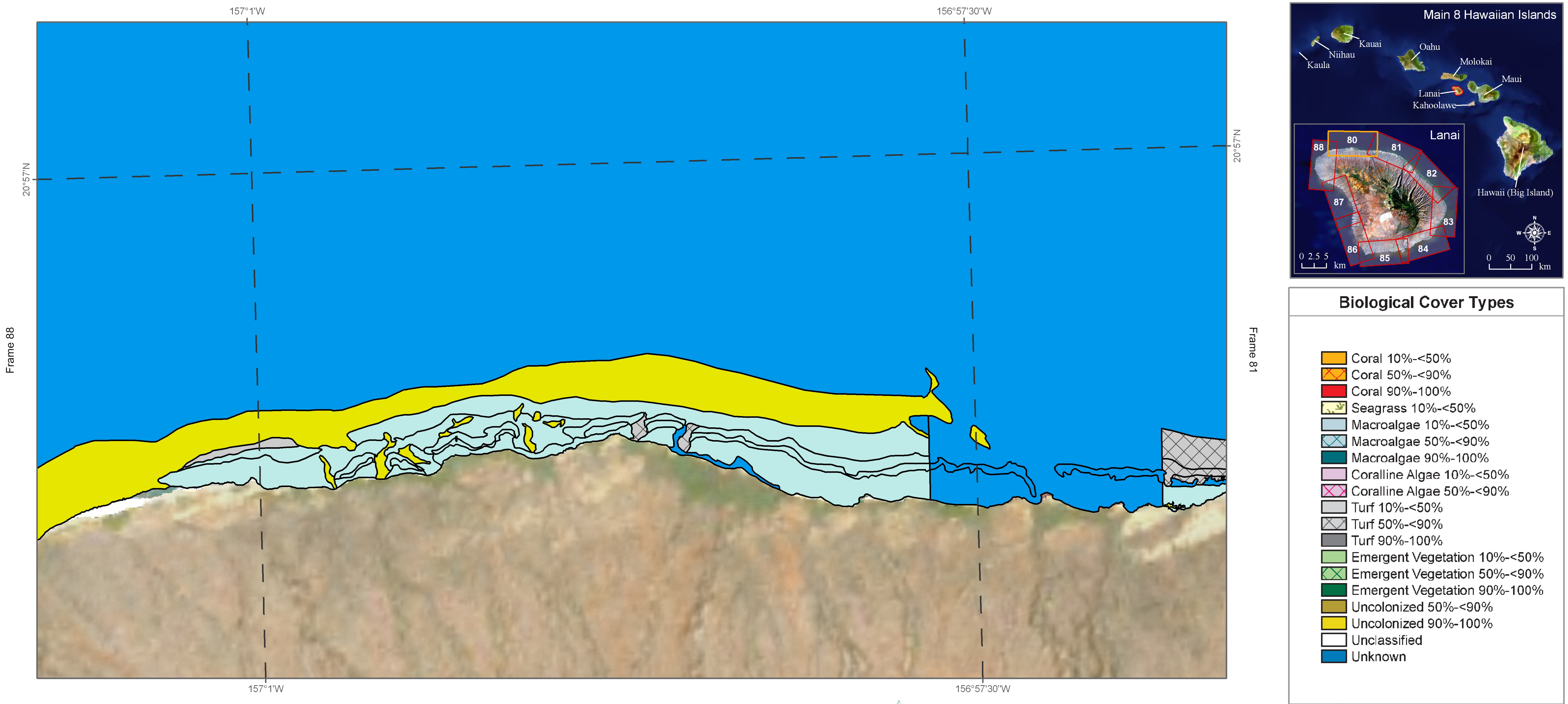
Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 80)


157°1'W
156°57'30"W
20°57'N
20°57'N
Frame 88
Frame 81
157°1'W
156°57'30"W
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
80
81
82
83
84
85
86
87
88
0 2.5 5
km
0 50 100
km
N
S
E
W

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- 🟦 Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- 🟦 Macroalgae 90%-100%
- 🟪 Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

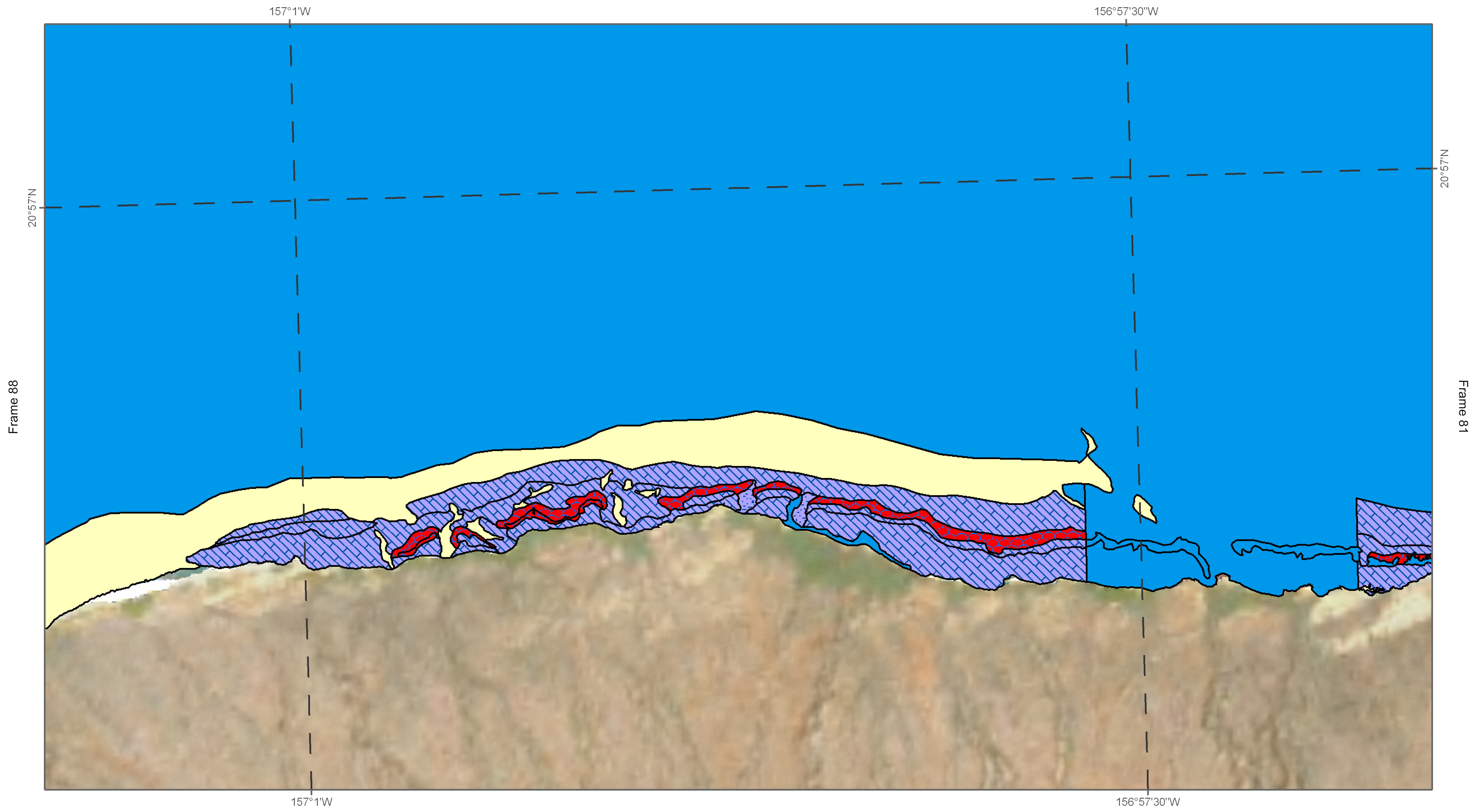
□ Minimum Mapping Unit (1 Acre)

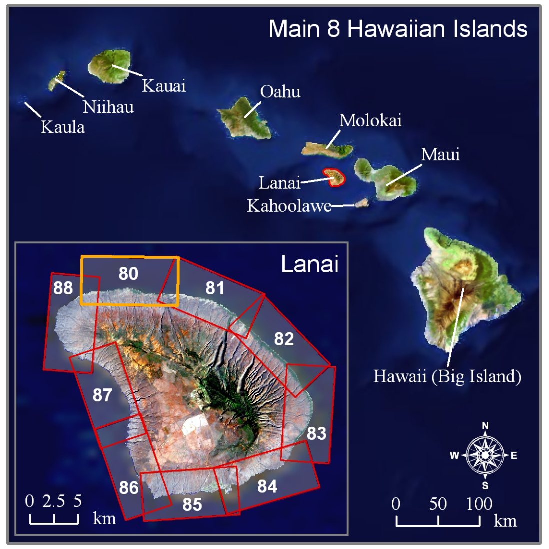
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 80)


157°1'W
156°57'30"W
20°57'N
20°57'N
Frame 88
Frame 81
157°1'W
156°57'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
88
80
81
82
87
83
86
84
85
0 2.5 5
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

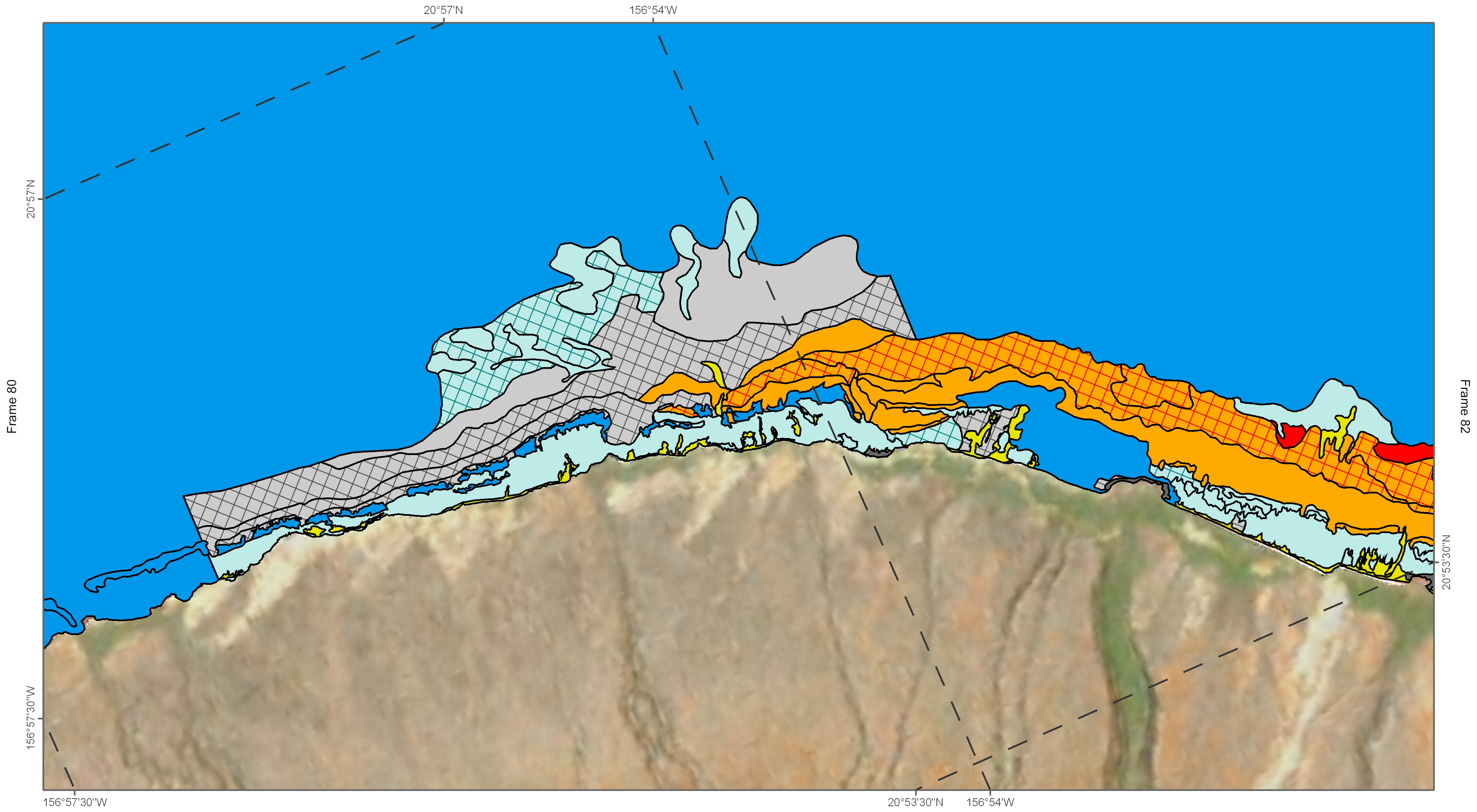
□ Minimum Mapping Unit (1 Acre)

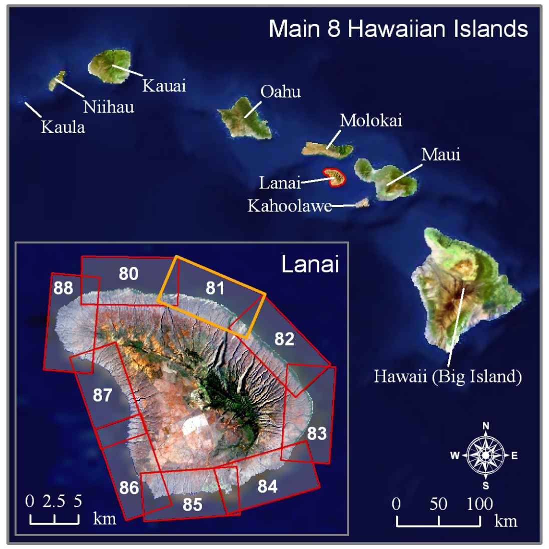
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 81)


20°57'N
156°54'W
20°57'N
Frame 80
156°57'30"W
Frame 82
20°53'30"N
156°57'30"W
20°53'30"N
156°54'W
0
0.5
1
1.5
km
mi
1
0.5
0


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
88
80
81
82
87
83
86
85
84
0 2.5 5
km
N
W
E
S
0 50 100
km

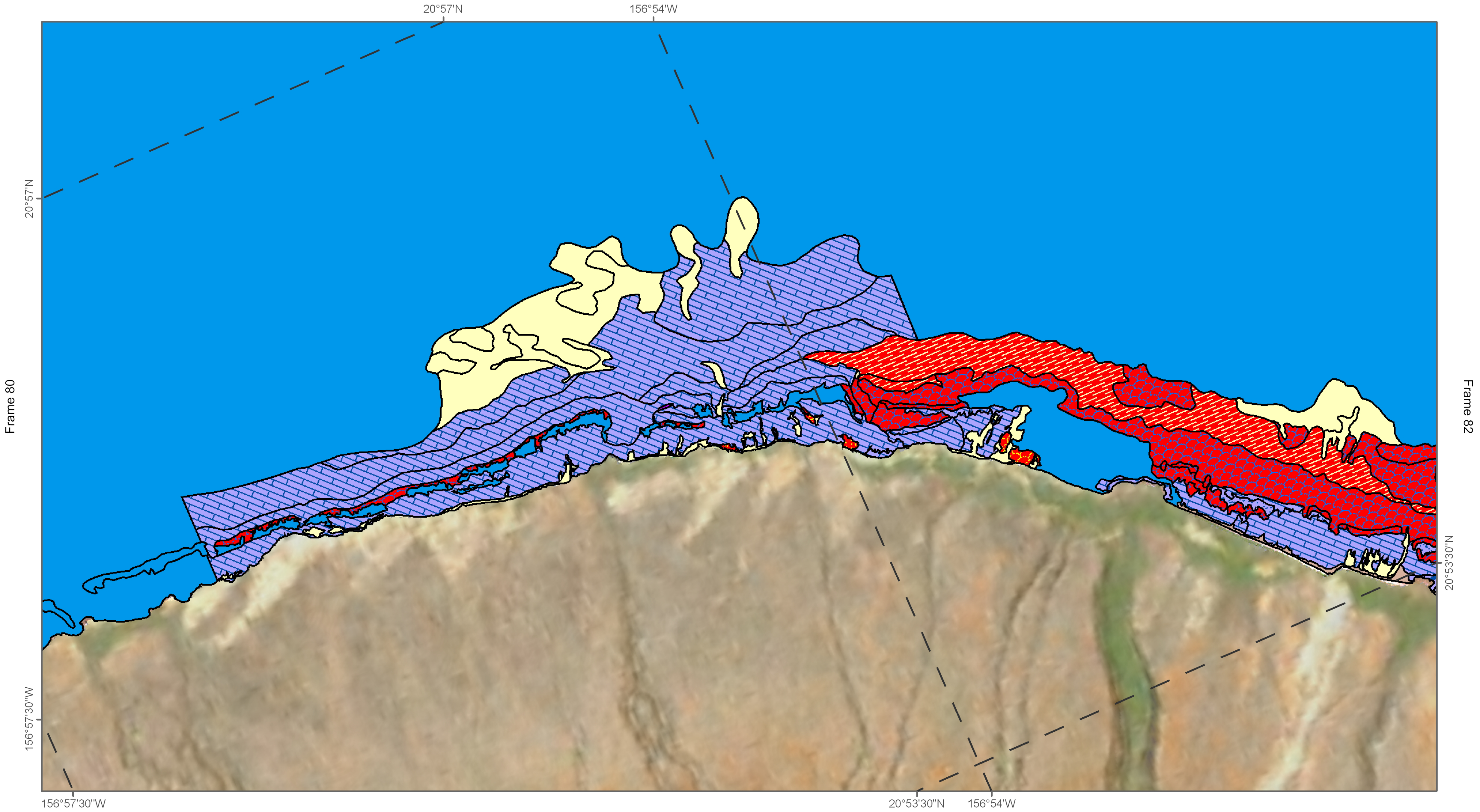
Biological Cover Types

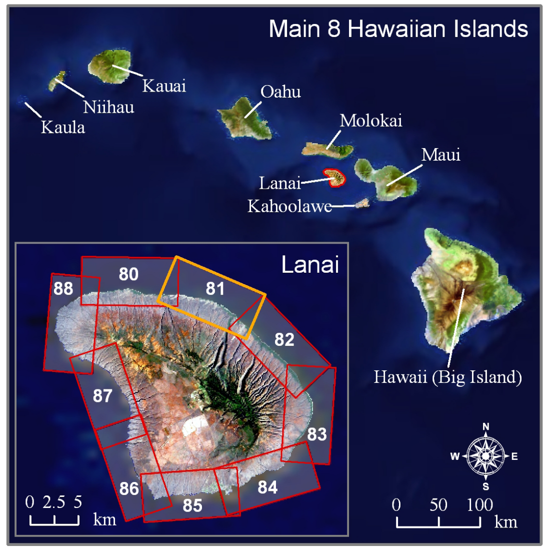
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 81)


20°57'N
156°54'W
20°57'N
Frame 80
Frame 82
20°53'30"N
156°57'30"W
20°53'30"N
156°54'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
88
80
81
82
87
83
86
85
84
0 2.5 5
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

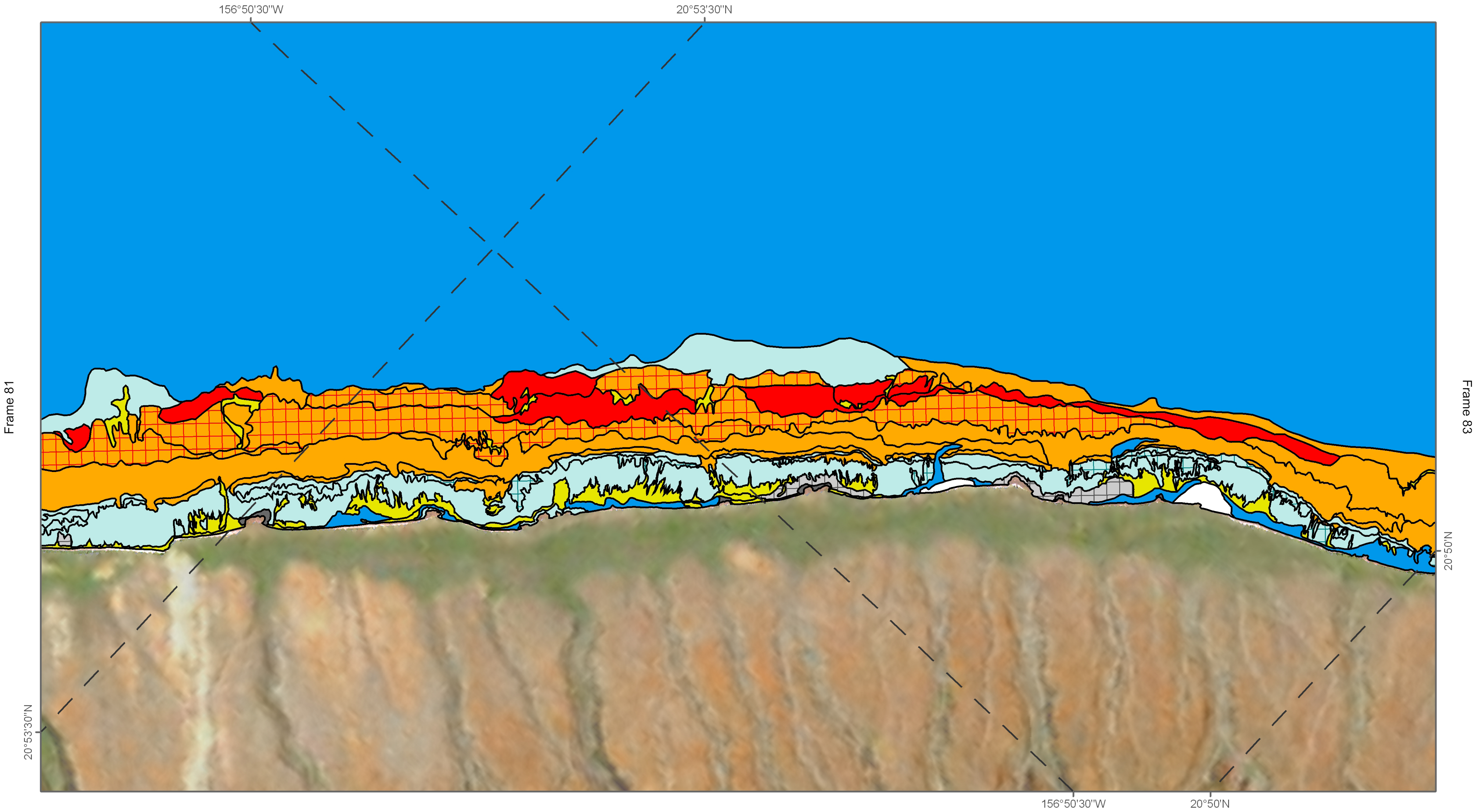
□ Minimum Mapping Unit (1 Acre)

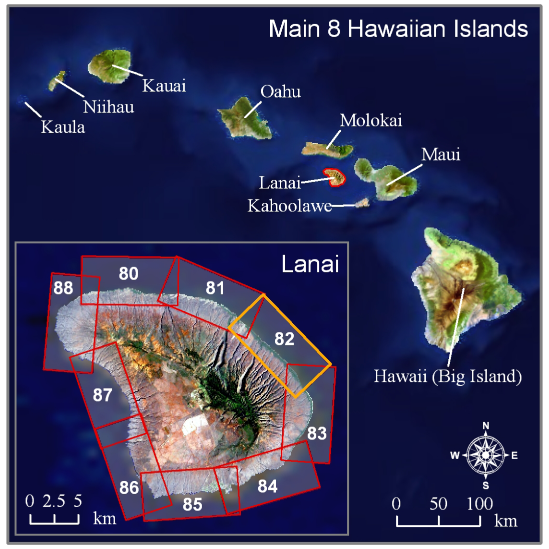
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 82)


156°50'30"W
20°53'30"N
Frame 81
Frame 83
20°50'N
20°53'30"N
156°50'30"W
20°50'N


Main 8 Hawaiian Islands
Kauai
Oahu
Niihau
Kaula
Molokai
Maui
Lanai
Kahoolawe
Lanai
88
80
81
82
87
83
86
85
84
0 2.5 5
km
Hawaii (Big Island)
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

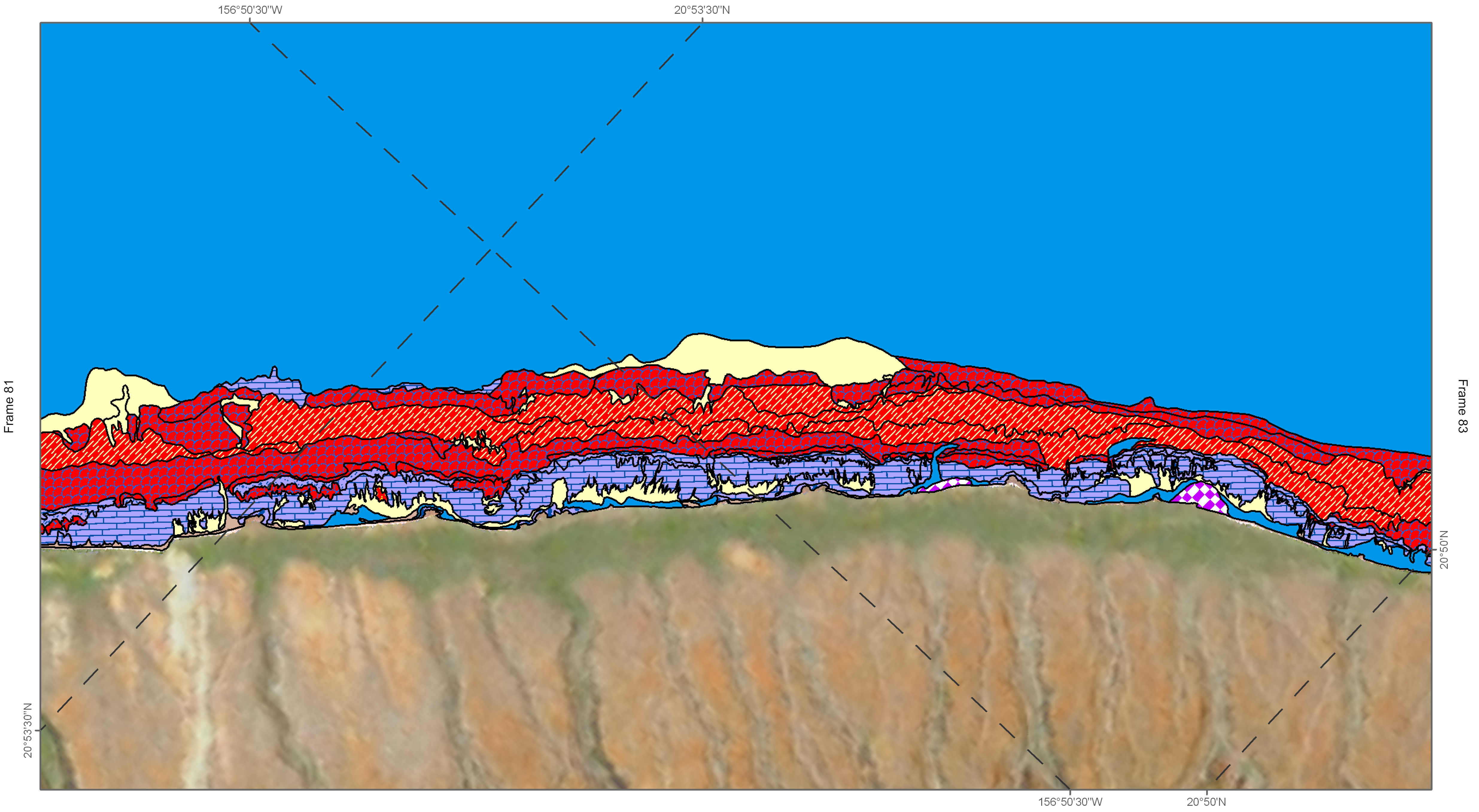
□ Minimum Mapping Unit (1 Acre)

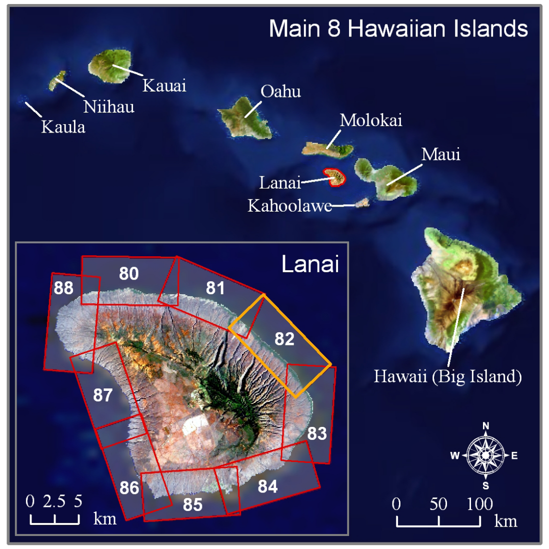
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi
1 0.5 0

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 82)


156°50'30"W
20°53'30"N
Frame 81
20°53'30"N
Frame 83
20°50'N
156°50'30"W
20°50'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
88
80
81
82
87
83
86
85
84
0 2.5 5
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- 🟪 Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

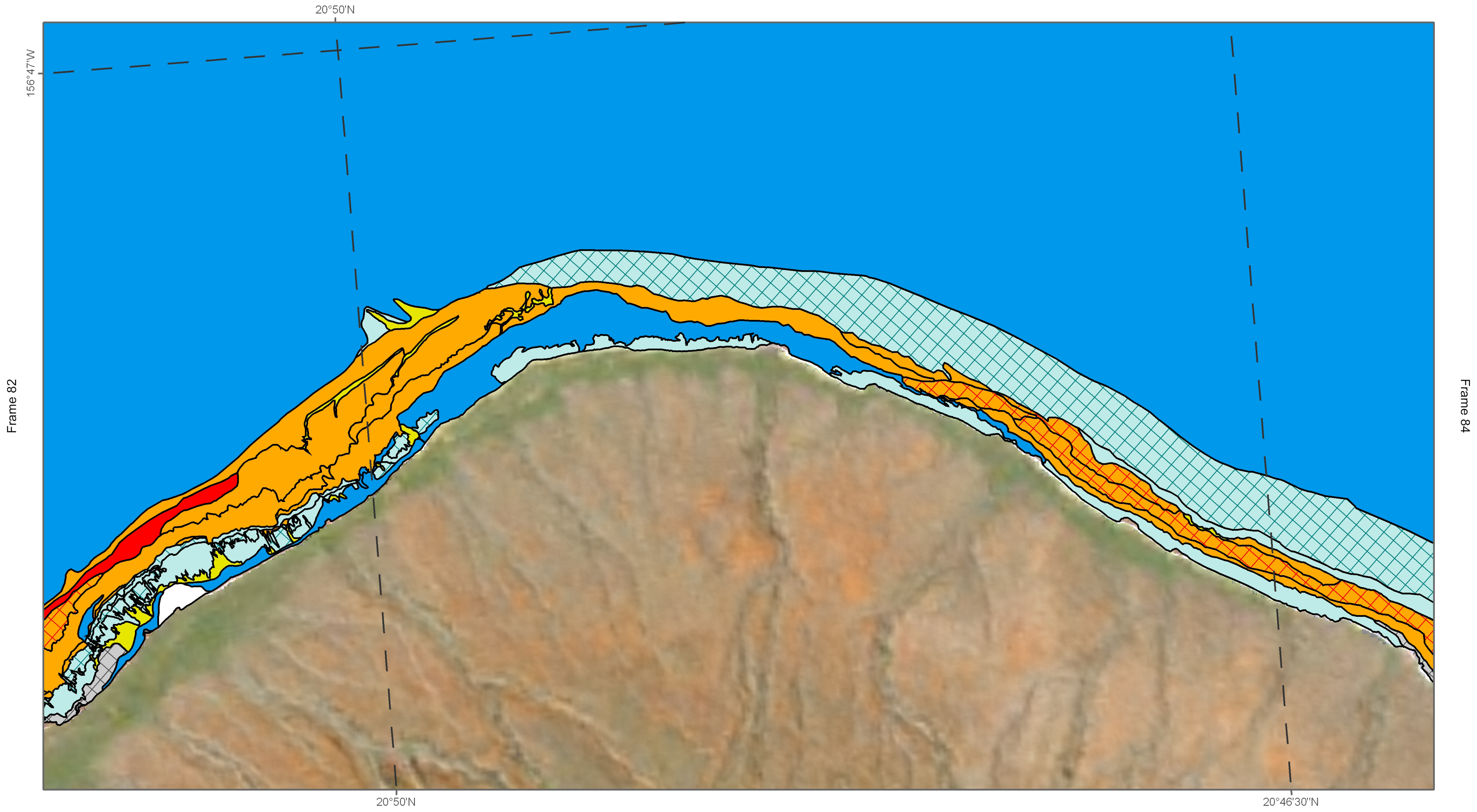
□ Minimum Mapping Unit (1 Acre)

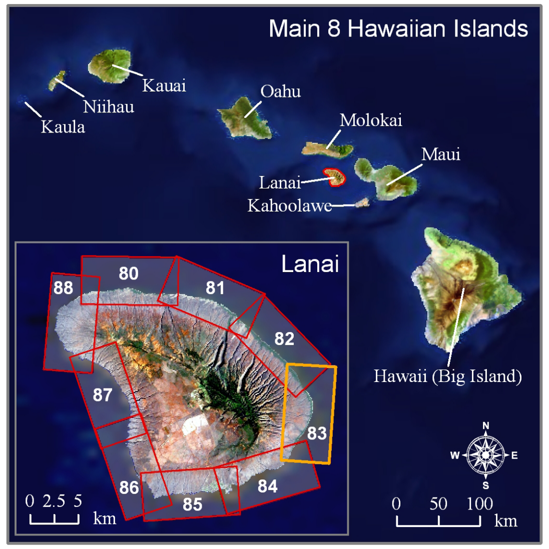
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 83)


20°50'N
156°47'W
Frame 82
Frame 84
20°50'N
20°46'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
88
80
81
82
87
83
86
85
84
0 2.5 5
km
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

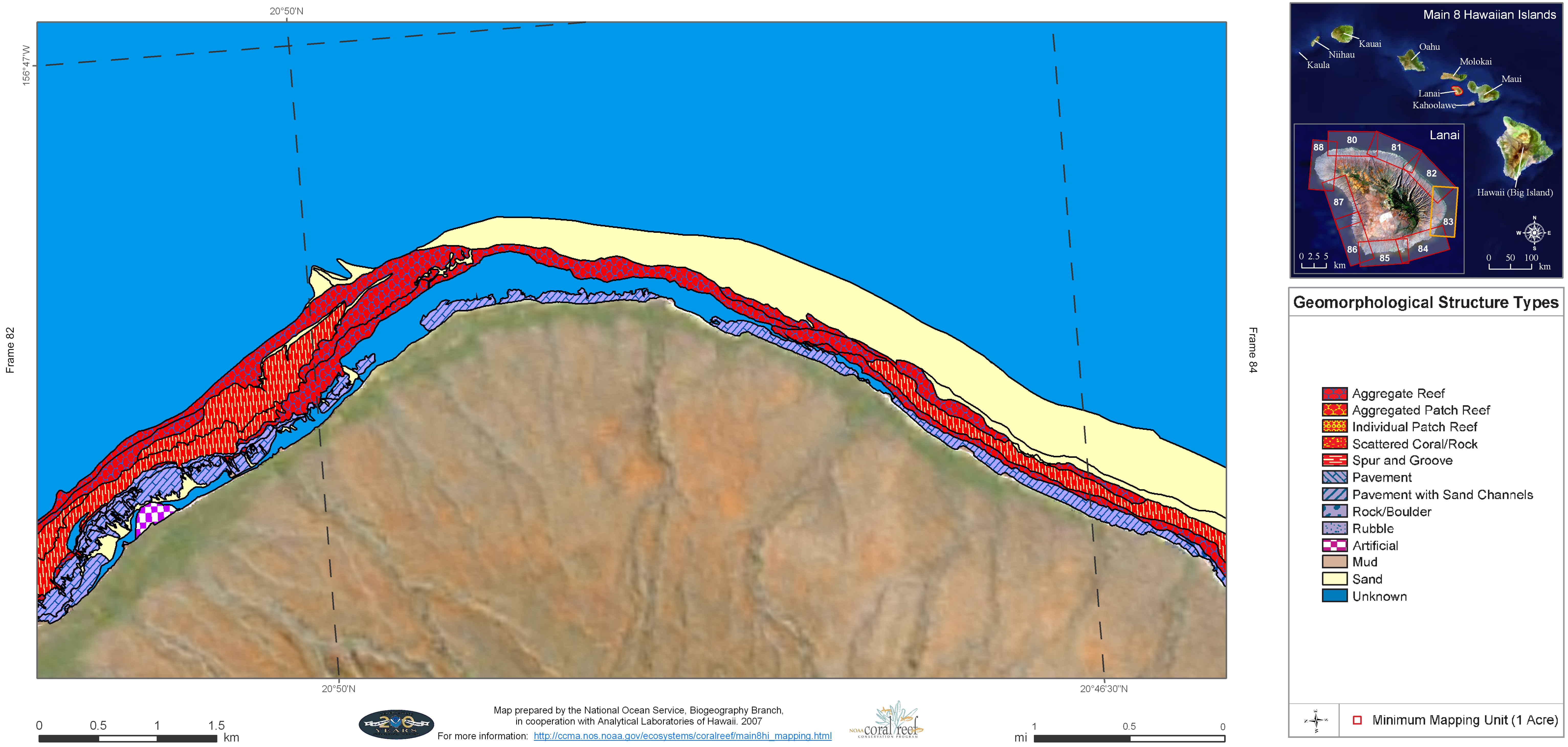
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

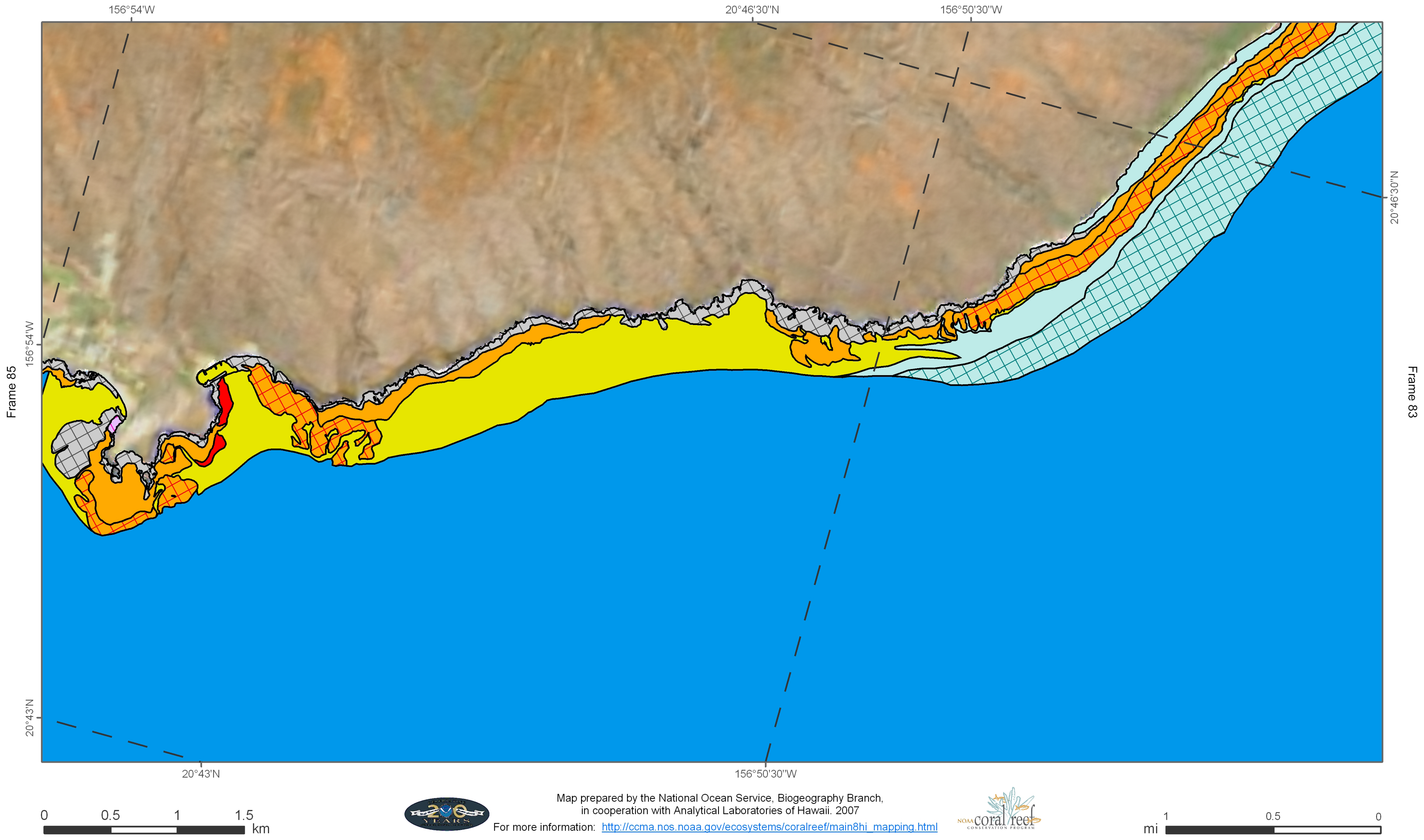
1 0.5 0
mi

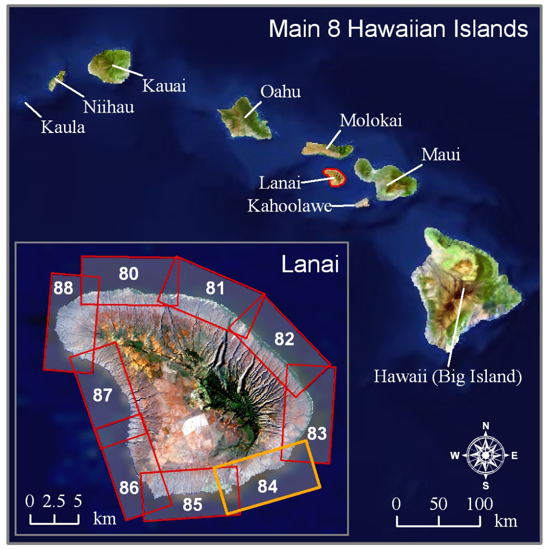
Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 83)


20°50'N
156°47'W
Frame 82
Frame 84
20°50'N
20°46'30"N
0 0.5 1 1.5 km
1 0.5 0 mi
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Lanai
88
80
81
82
83
84
85
86
87
0 2.5 5 km
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 84)


156°54'W
20°46'30"N
156°50'30"W
20°46'30"N
156°54'W
20°43'N
20°43'N
156°50'30"W
Frame 85
Frame 83
0
0.5
1
1.5
km
mi
1
0.5
0


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
80
81
88
82
87
83
86
84
85
0 2.5 5
km
0 50 100
km
N
W
E
S

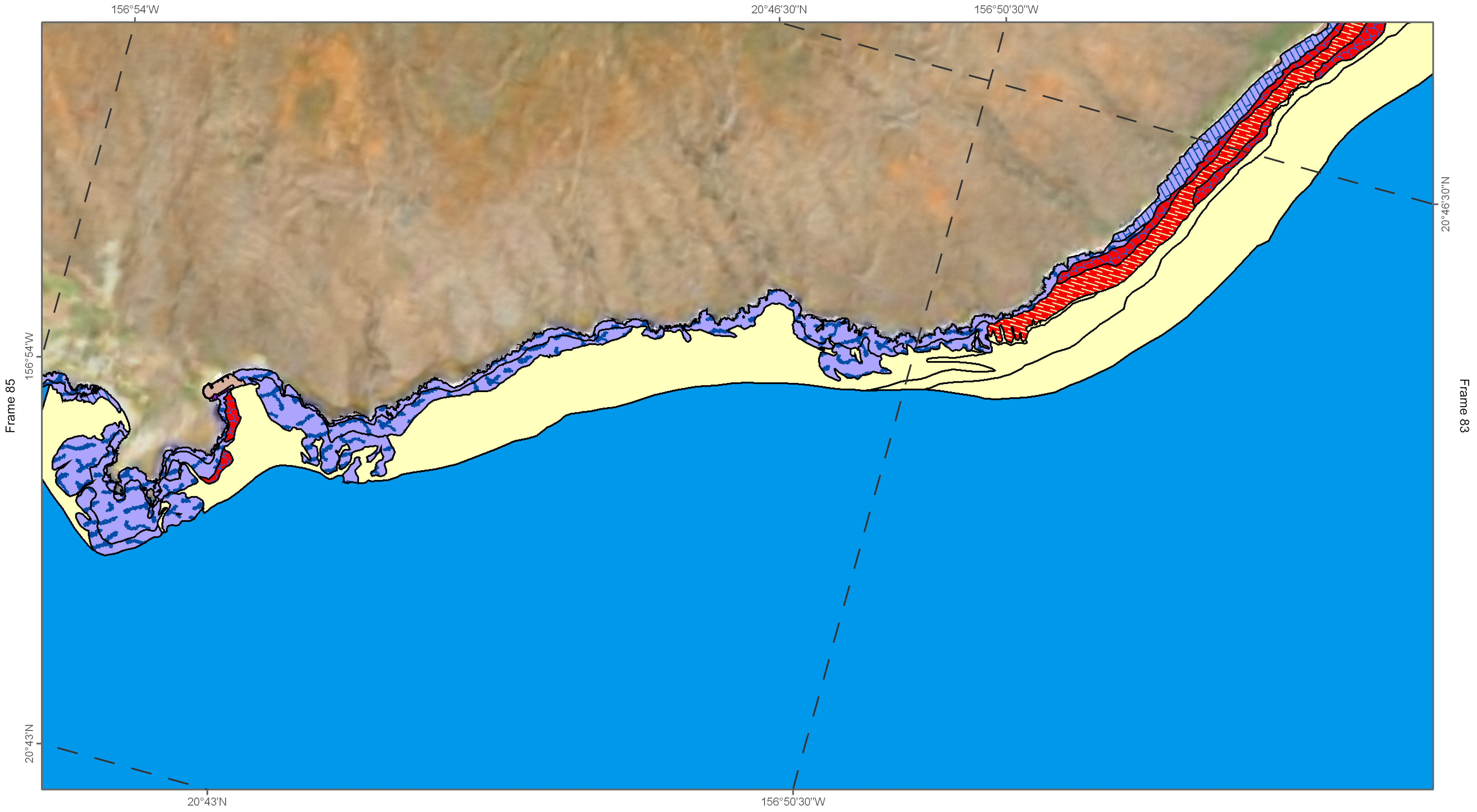
Biological Cover Types

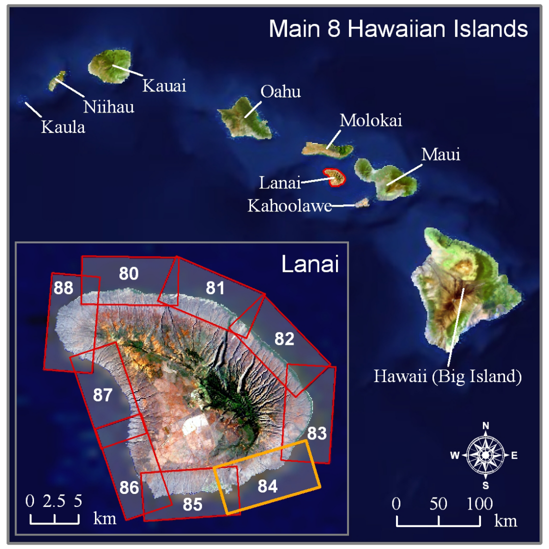
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ⬛ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 84)


156°54'W
20°46'30"N
156°50'30"W
20°46'30"N
156°54'W
20°43'N
20°43'N
156°50'30"W
Frame 85
Frame 83


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
80
81
82
83
84
85
86
87
88
0 2.5 5
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ☐ Sand
- ▨ Unknown

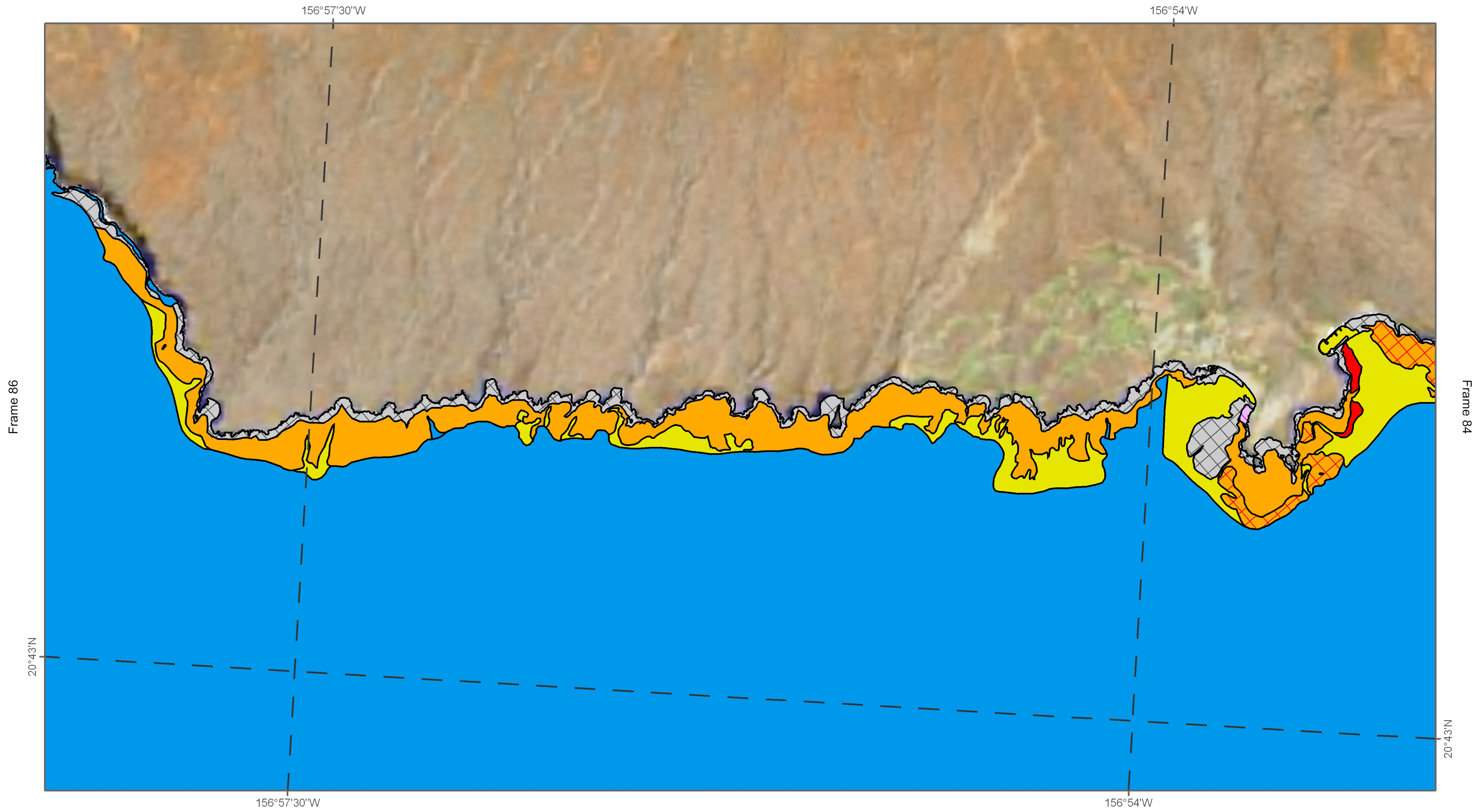
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 85)


156°57'30"W
156°54'W
Frame 86
Frame 84
20°43'N
20°43'N
156°57'30"W
156°54'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
88
80
81
82
87
83
86
85
84
0 2.5 5 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▢ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▢ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▢ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

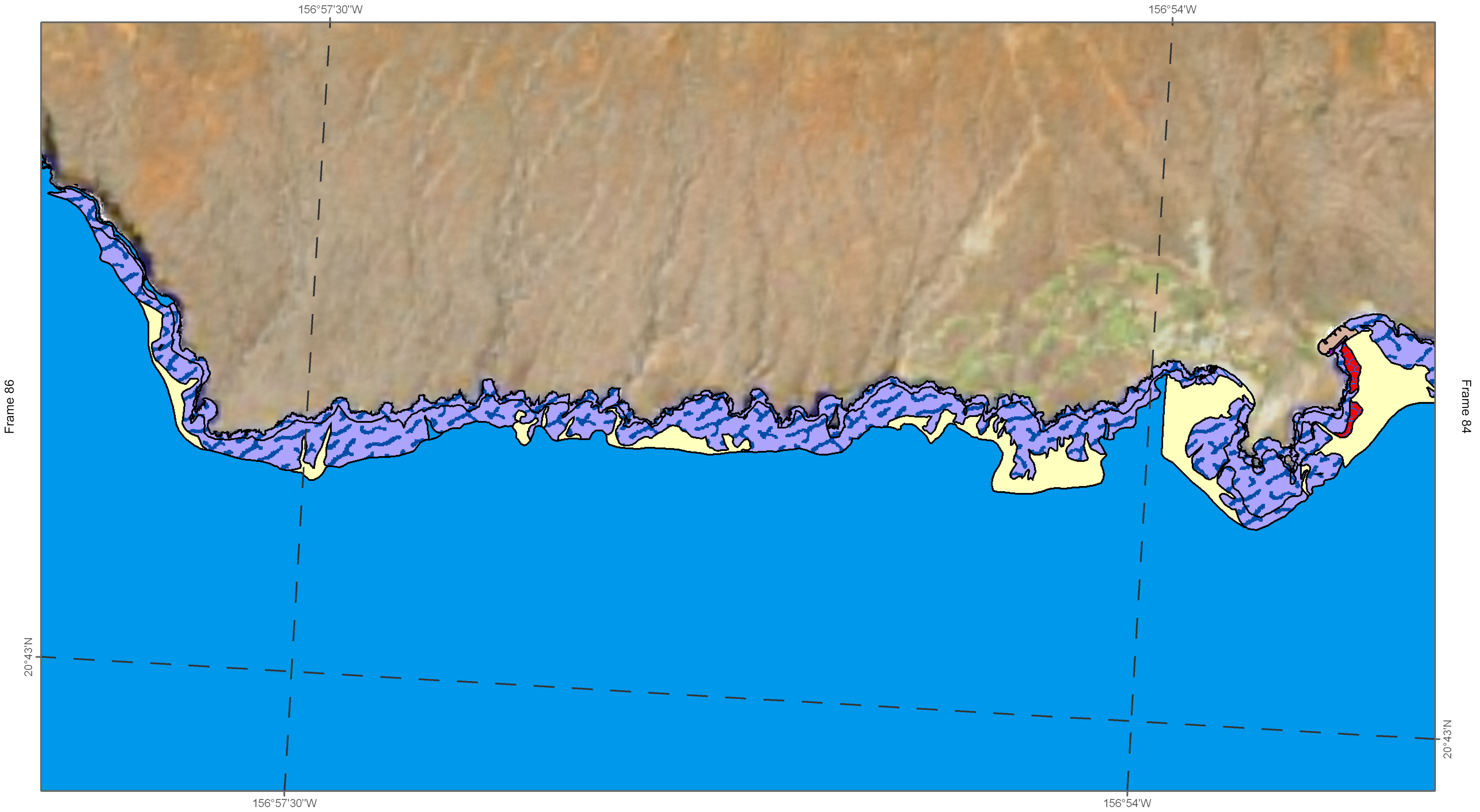
🟥 Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 85)


156°57'30"W
156°54'W
Frame 86
Frame 84
20°43'N
20°43'N
156°57'30"W
156°54'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100
km
Lanai
88
80
81
82
87
83
86
85
84
0 2.5 5
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

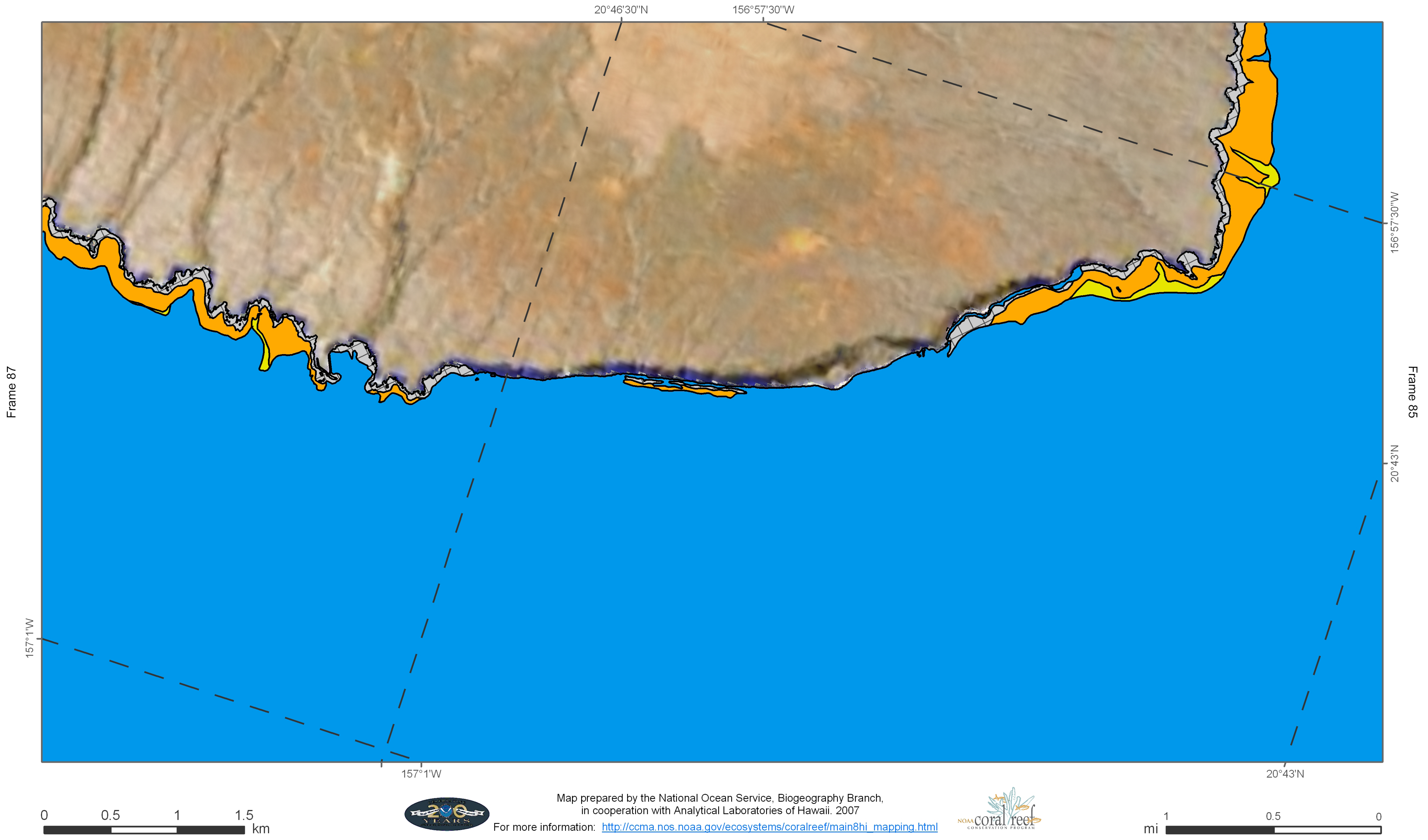
□ Minimum Mapping Unit (1 Acre)

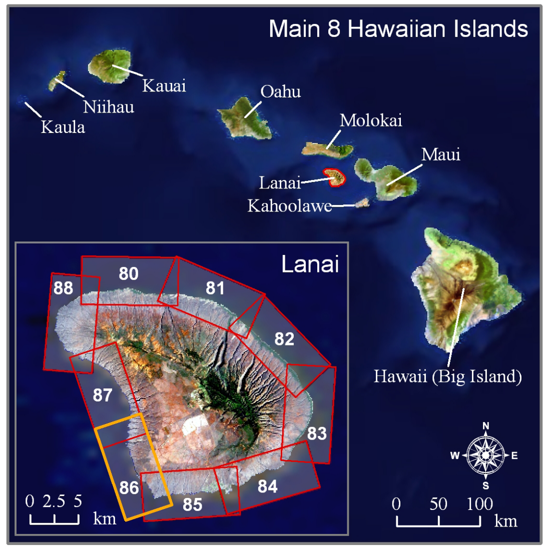
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 86)


20°46'30"N
156°57'30"W
156°57'30"W
20°43'N
Frame 87
Frame 85
157°1'W
157°1'W
20°43'N
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Oahu
Niihau
Kaula
Molokai
Maui
Lanai
Kahoolawe
Lanai
88
80
81
82
87
83
86
84
85
0 2.5 5 km
Hawaii (Big Island)
N
W
E
S
0 50 100 km

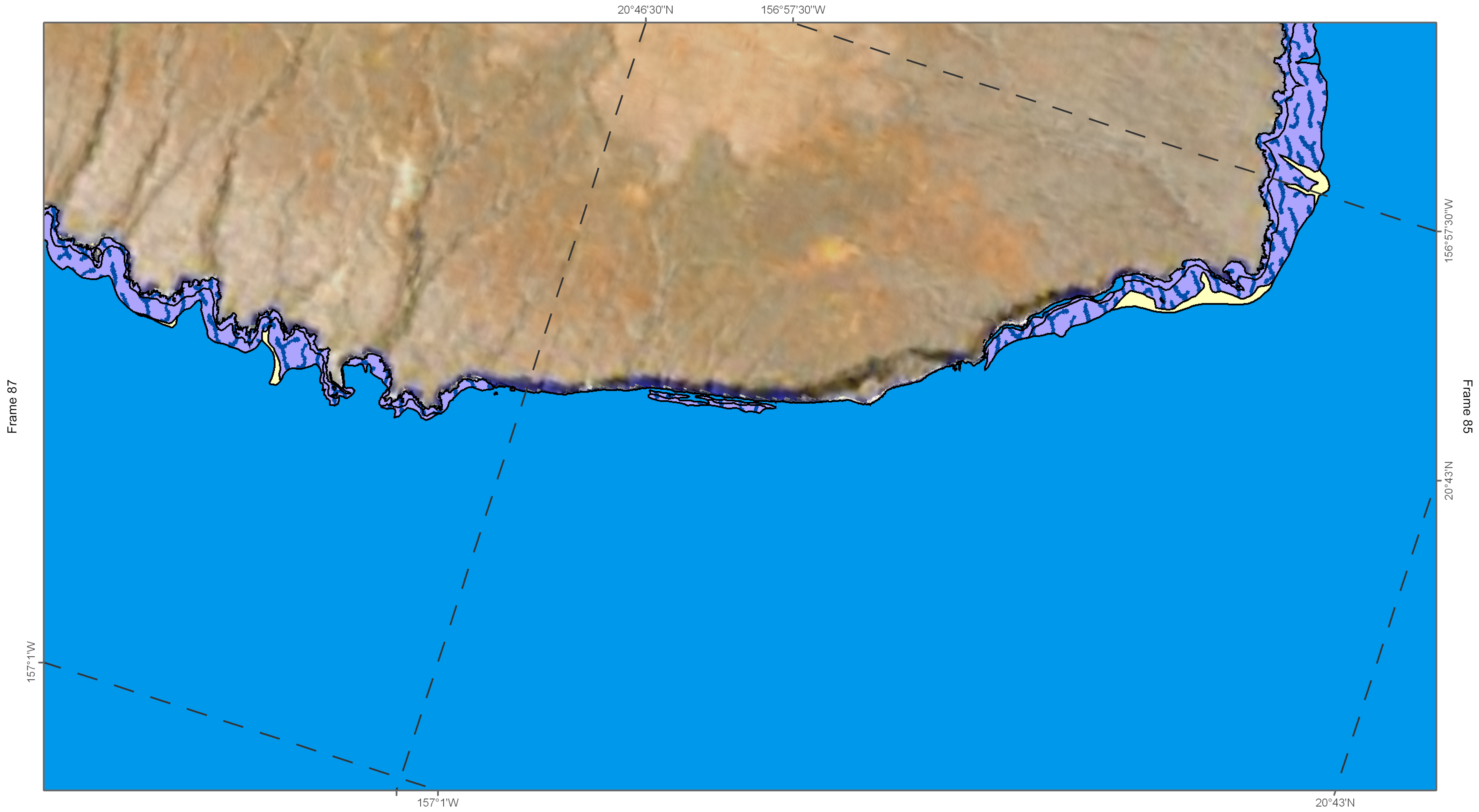
Biological Cover Types

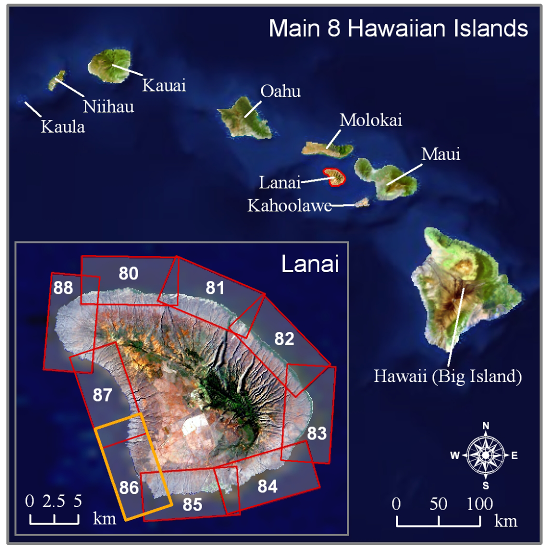
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 86)


20°46'30"N
156°57'30"W
156°57'30"W
20°43'N
Frame 85
Frame 87
157°1'W
157°1'W
20°43'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
88
80
81
82
87
83
86
85
84
0 2.5 5
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

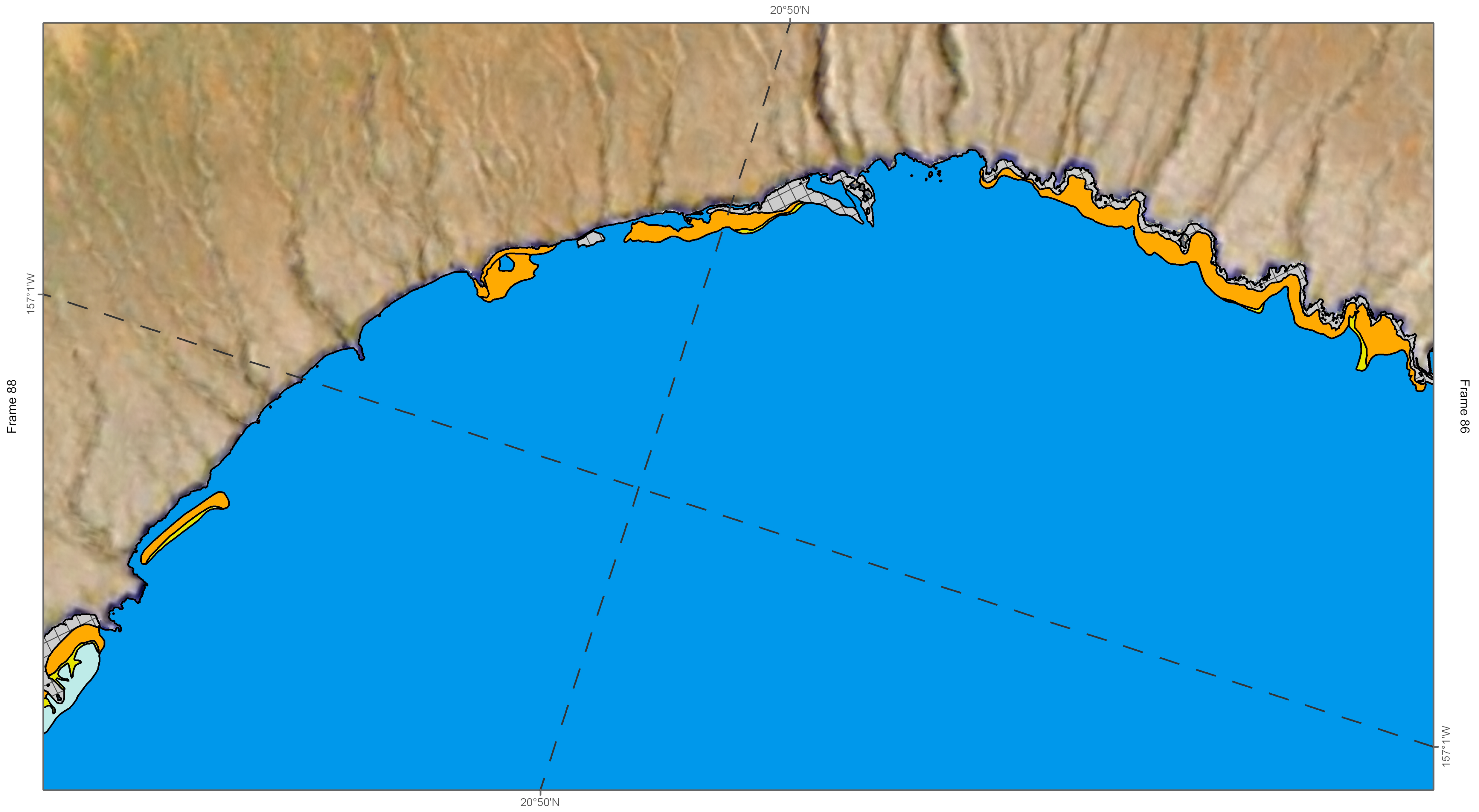
□ Minimum Mapping Unit (1 Acre)

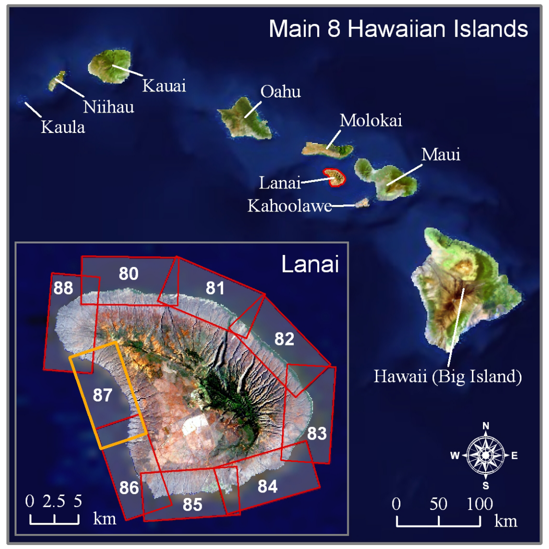
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 87)


20°50'N
157°1'W
Frame 88
Frame 86
157°1'W
20°50'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
80
81
82
83
84
85
86
87
88
0 2.5 5 km
0 50 100 km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

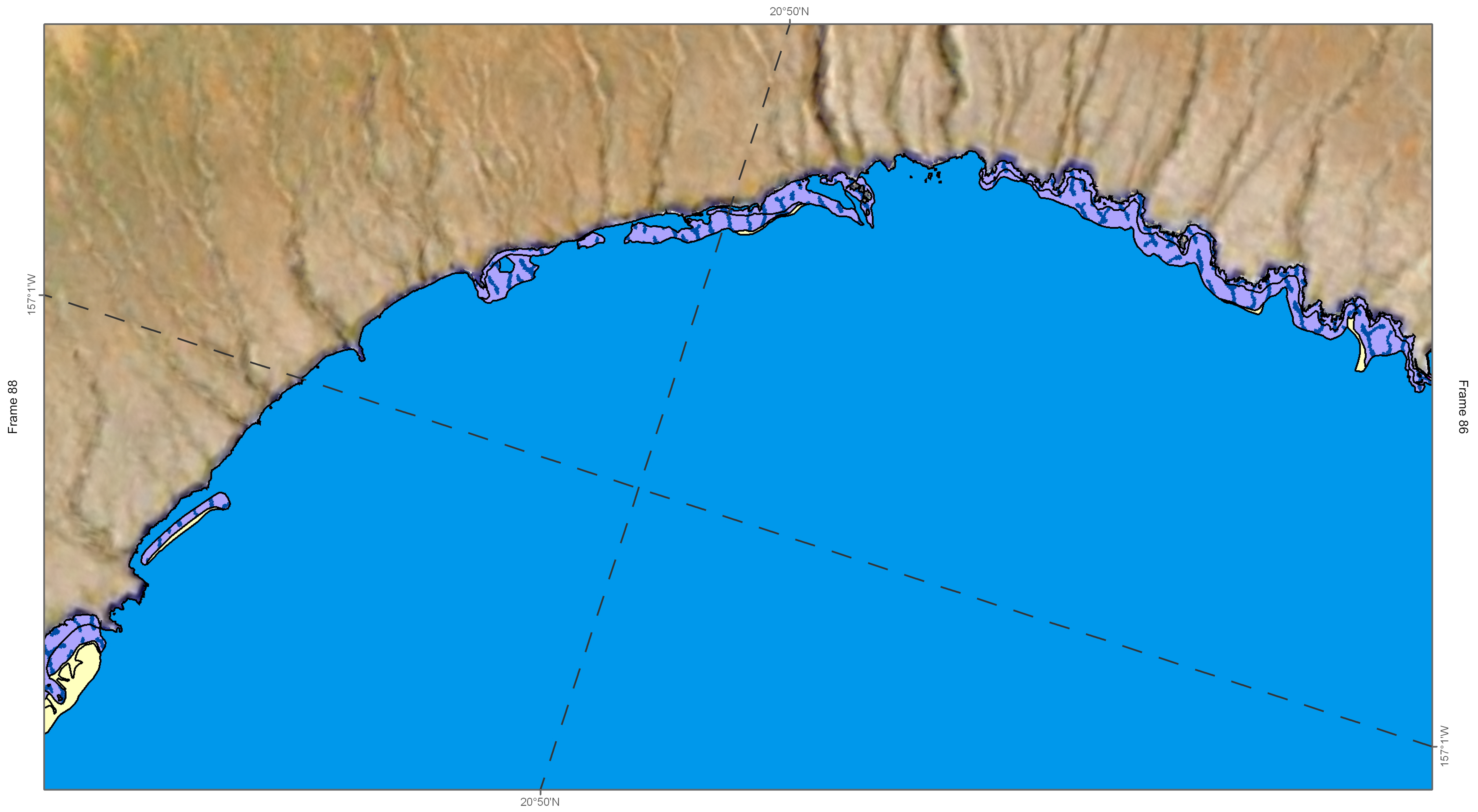
□ Minimum Mapping Unit (1 Acre)

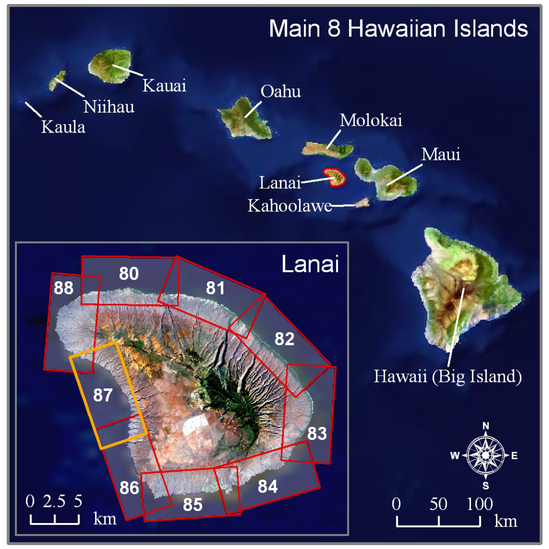
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 87)


20°50'N
157°1'W
Frame 88
Frame 86
157°1'W
20°50'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
88
80
81
82
87
83
86
85
84
0 2.5 5
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

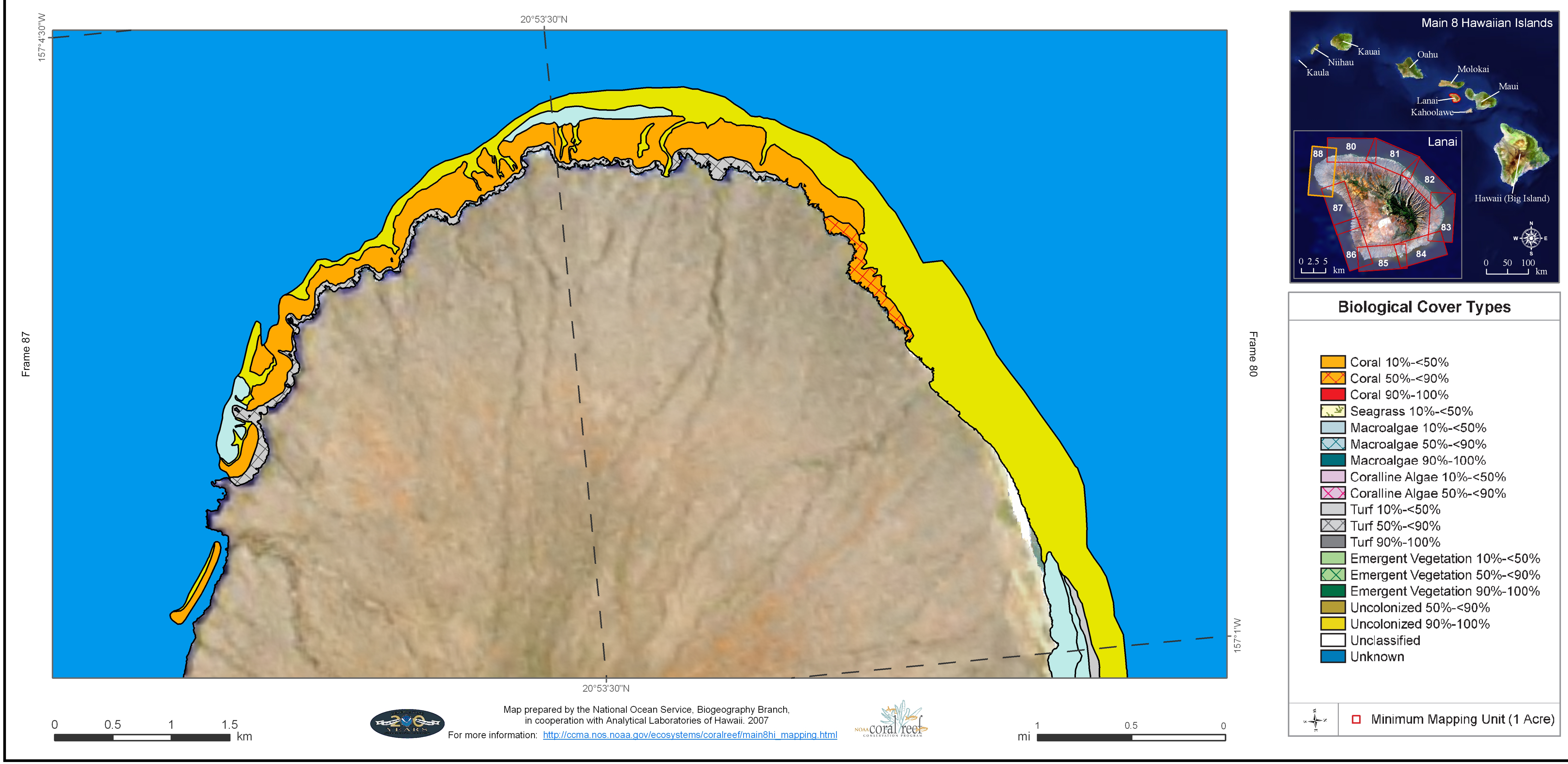
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 88)


20°53'30"N
157°4'30"W
Frame 87
Frame 80
157°1'W
20°53'30"N
0
0.5
1
1.5
km
mi
1
0.5
0
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
88
80
81
82
87
83
86
84
85
0 2.5 5
km
0 50 100
km
N
W
E
S

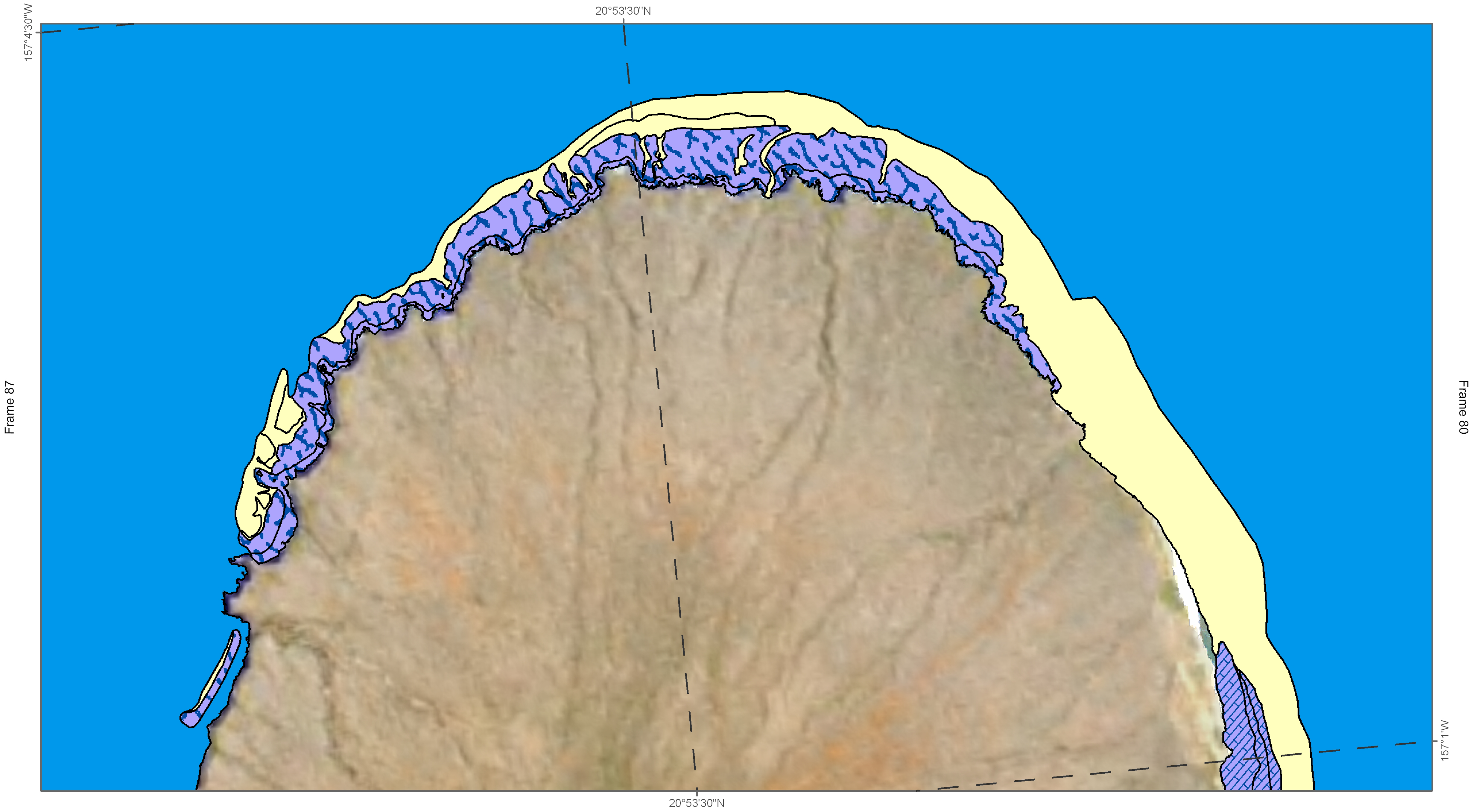
Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Lanai) : Shallow-water Benthic Habitats (Frame 88)


20°53'30"N
157°4'30"W
Frame 87
Frame 80
157°1'W
20°53'30"N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Lanai
88
80
81
82
87
83
86
85
84
0 2.5 5 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

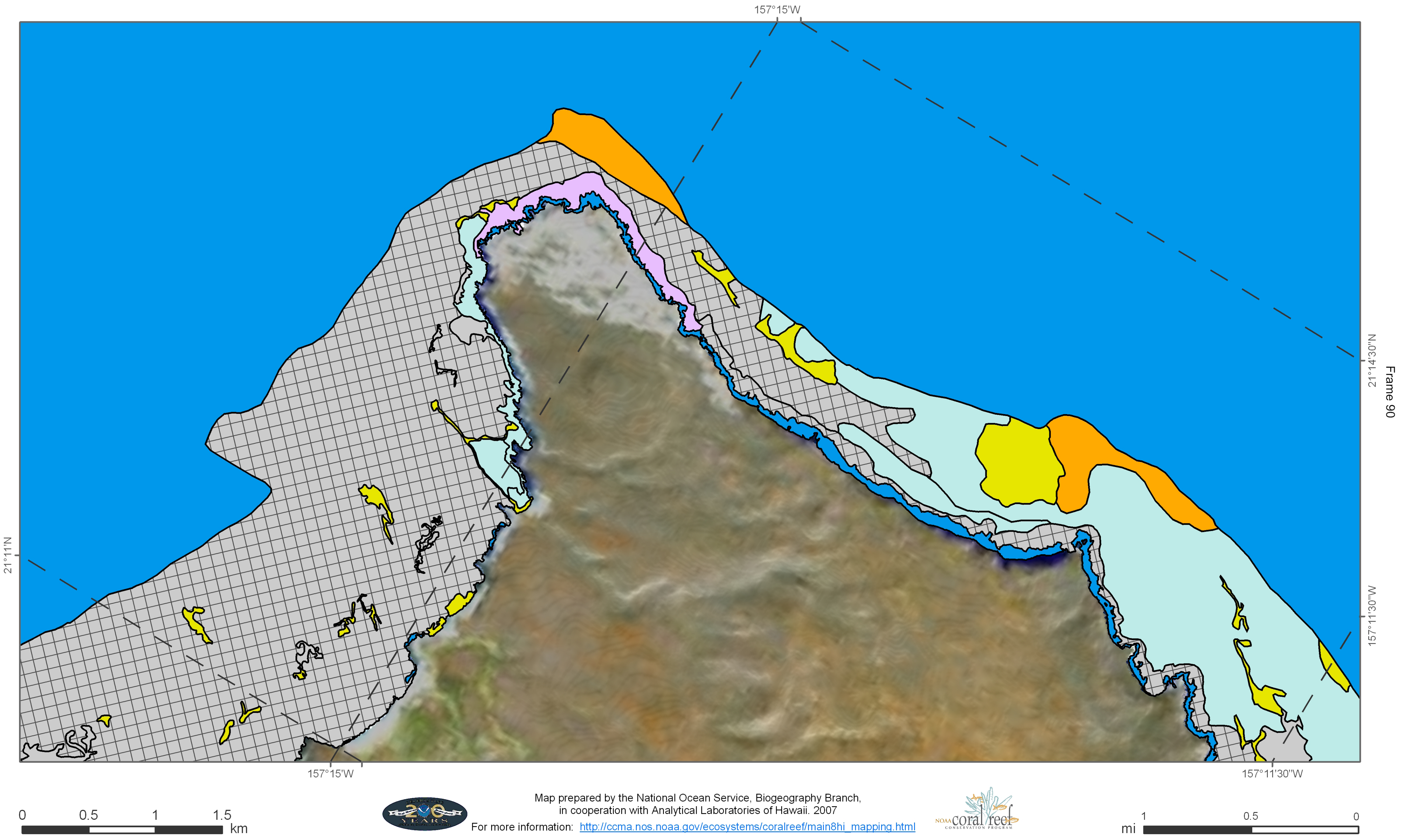
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 89)



157°15'W
21°14'30"N
Frame 90
21°11'N
157°11'30"W
157°15'W
157°11'30"W
0
0.5
1
1.5
km
1
0.5
0
mi

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
90
91
92
93
94
95
105
96
104
103
102
101
100
99
98
97
0 5 10
km
0 50 100
km
N
W
E
S

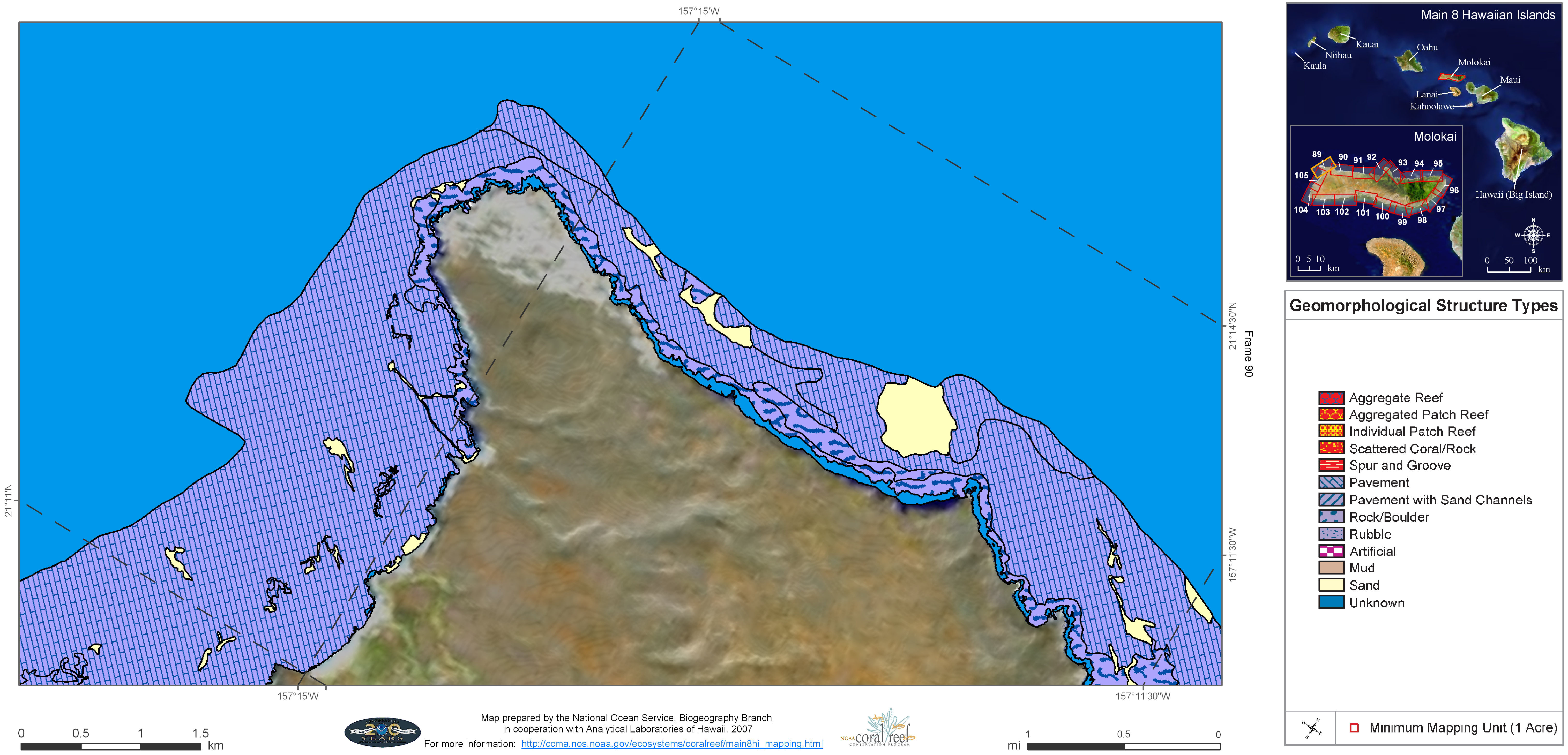
Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

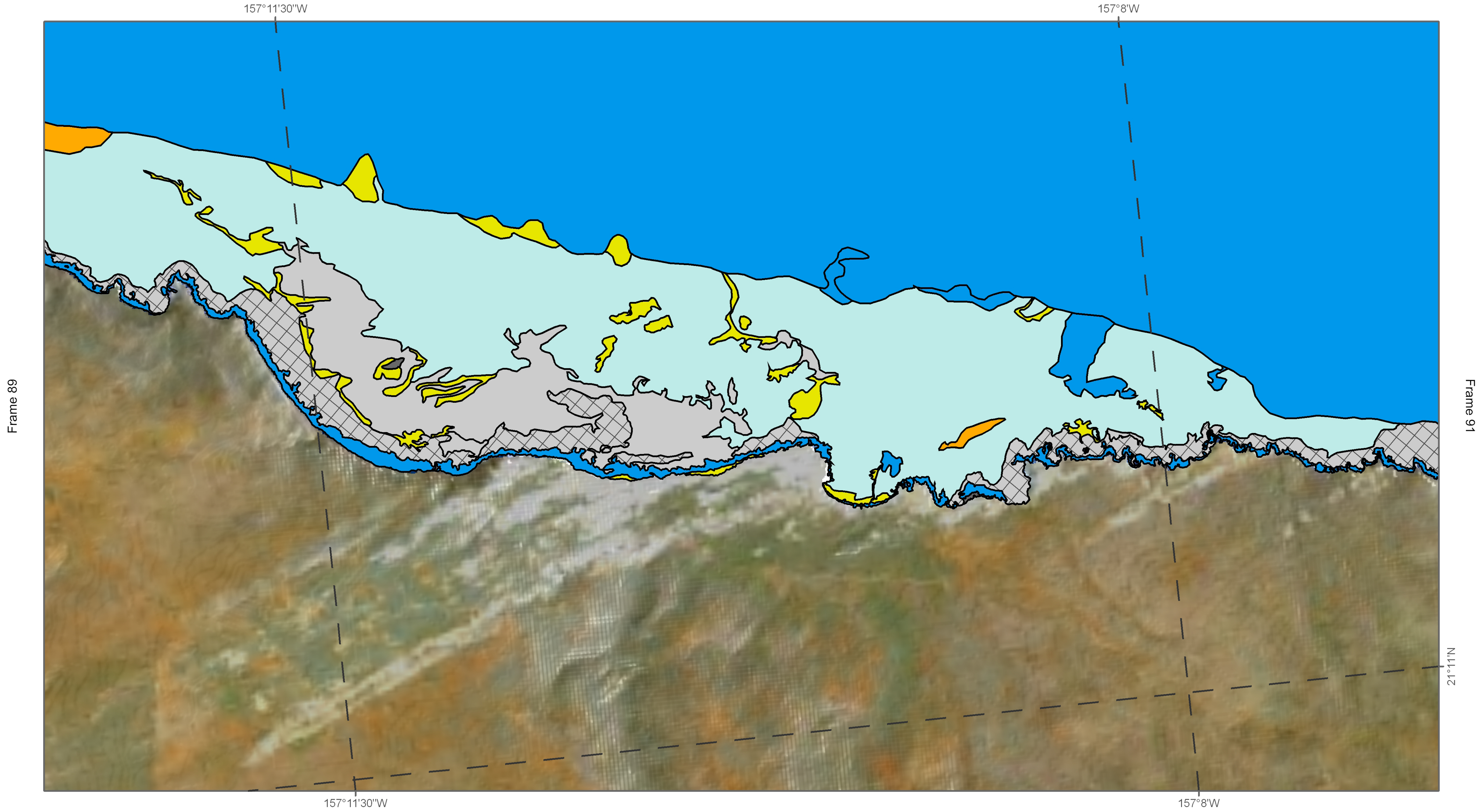
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

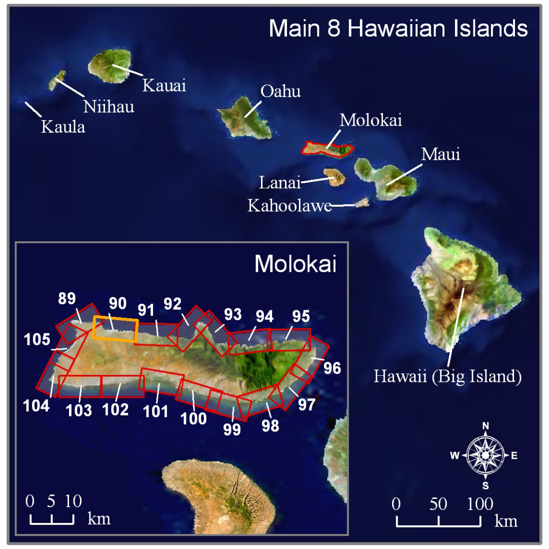
Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 89)


157°15'W
21°14'30"N
Frame 90
21°11'N
157°11'30"W
157°15'W
157°11'30"W
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
0 5 10 km
0 50 100 km
N
S
E
W
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)
0 0.5 1 1.5 km
1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 90)


157°11'30"W
157°8'W
Frame 89
Frame 91
21°11'N
157°11'30"W
157°8'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
0 5 10
km
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

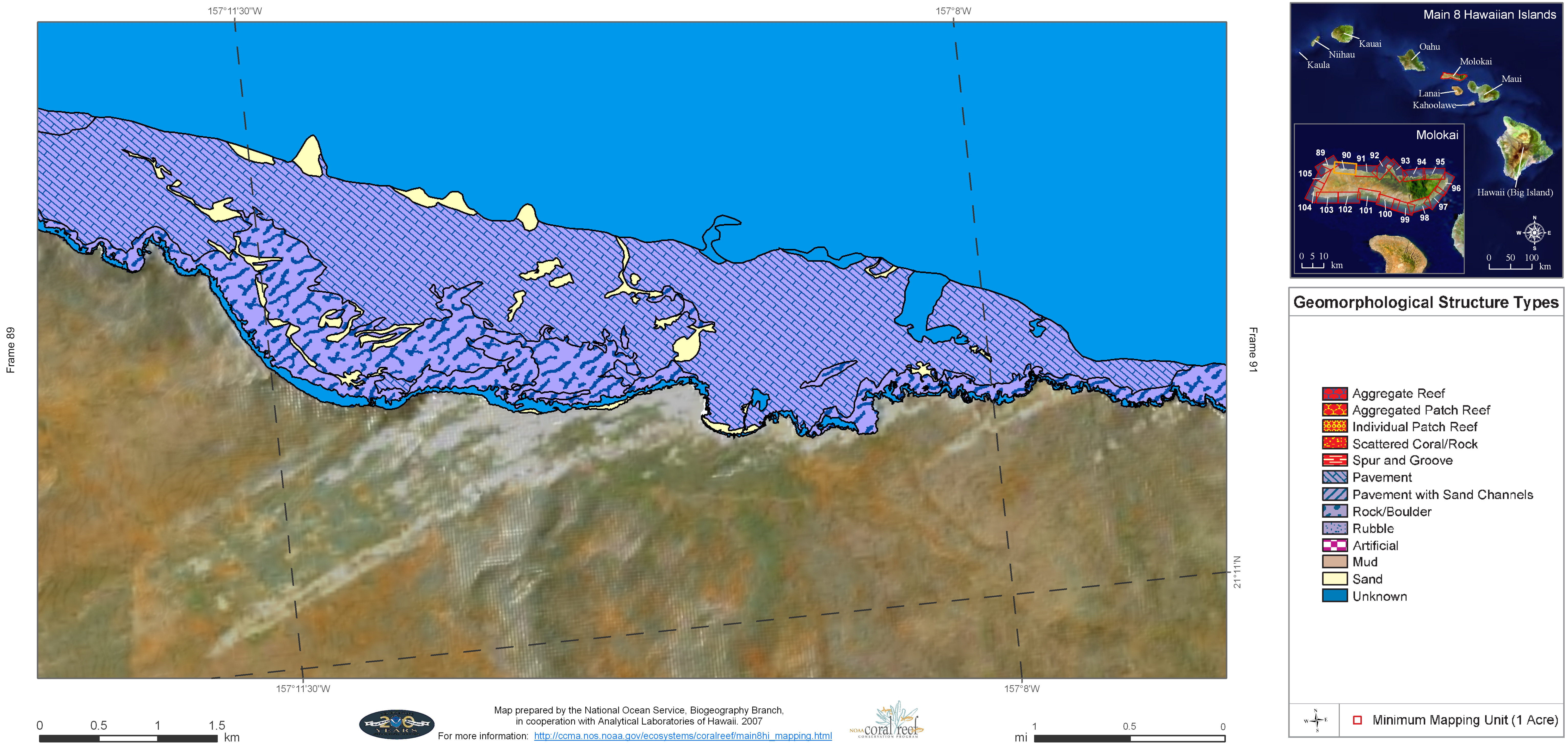
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

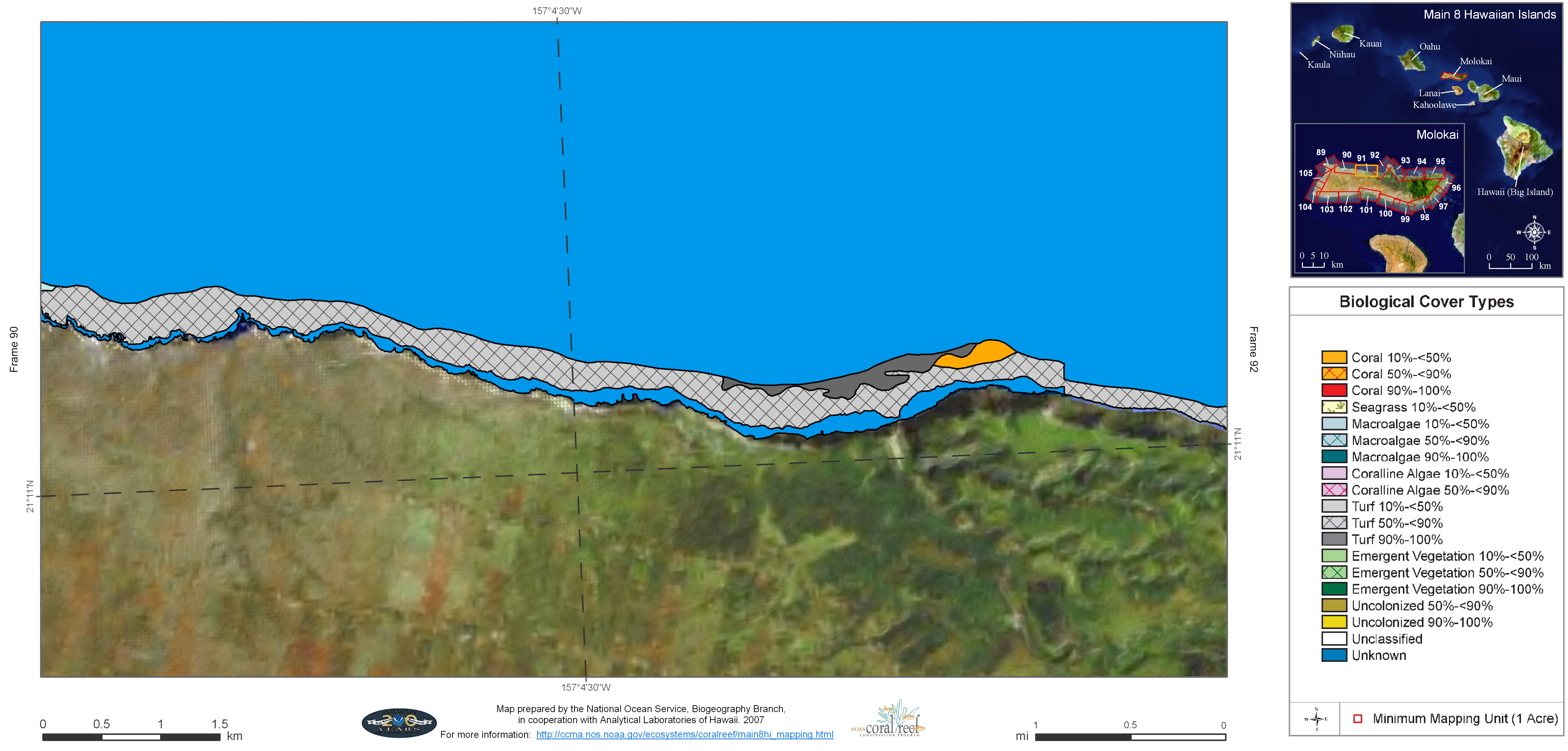
1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 90)


157°11'30"W
157°8'W
Frame 89
Frame 91
21°11'N
157°11'30"W
157°8'W
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Molokai
89 90 91 92 93 94 95
105
96
104 103 102 101 100 99 98 97
0 5 10 km
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)
0 0.5 1 1.5 km
1 0.5 0 mi

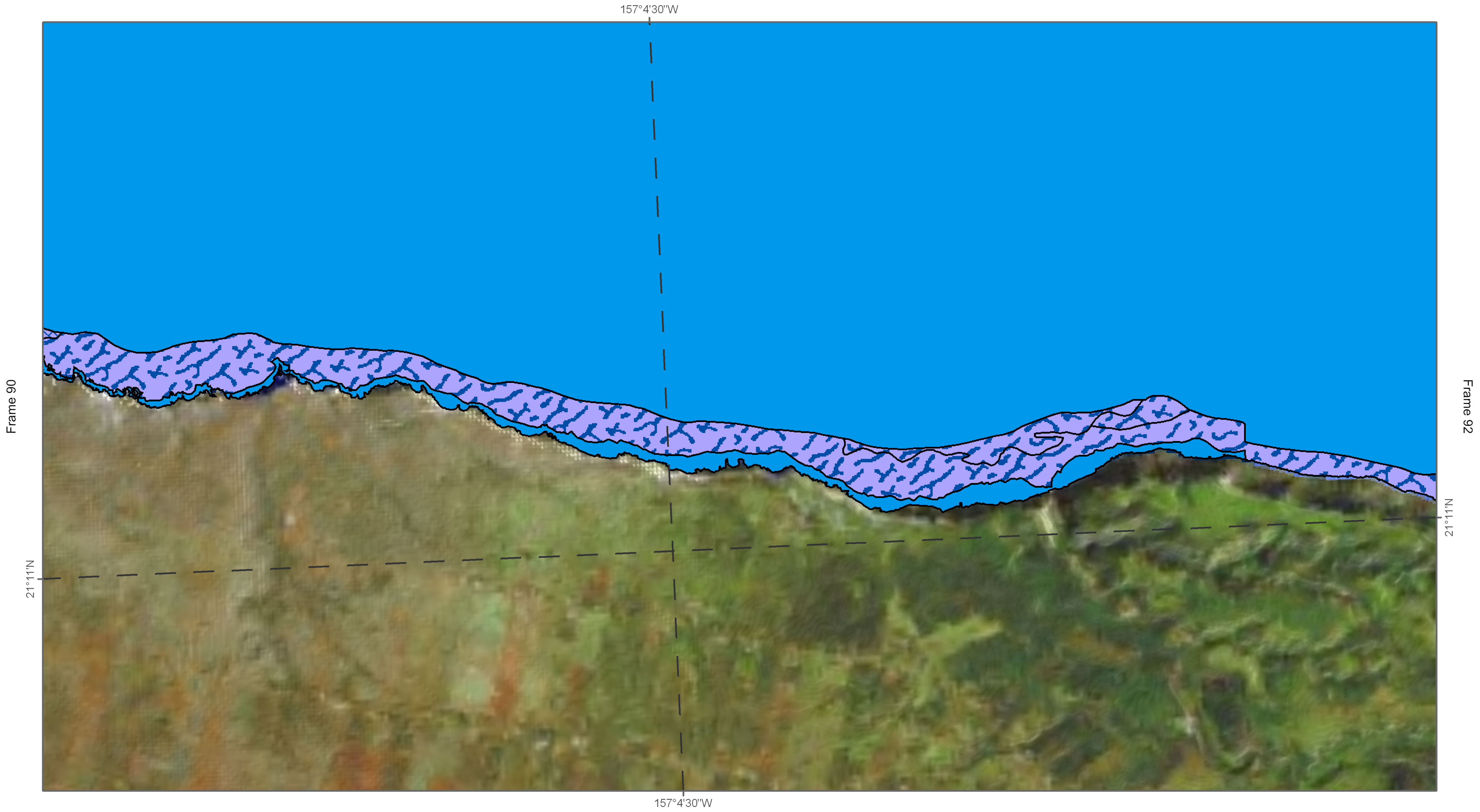
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

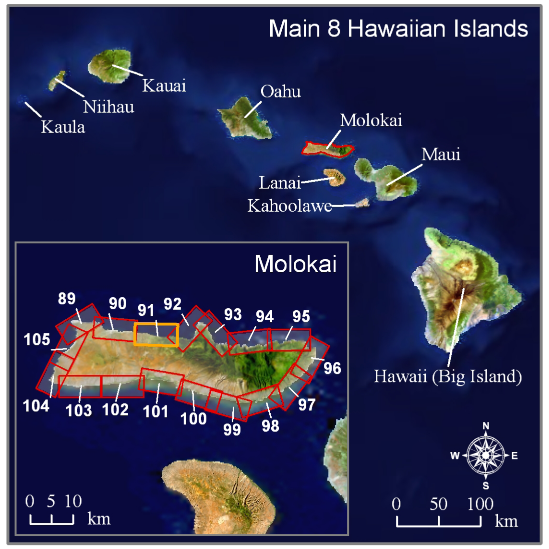
Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 91)


157°4'30"W
Frame 90
Frame 92
21°11'N
21°11'N
157°4'30"W
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Molokai
89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105
0 5 10 km
Biological Cover Types
Coral 10%-<50%
Coral 50%-<90%
Coral 90%-100%
Seagrass 10%-<50%
Macroalgae 10%-<50%
Macroalgae 50%-<90%
Macroalgae 90%-100%
Coralline Algae 10%-<50%
Coralline Algae 50%-<90%
Turf 10%-<50%
Turf 50%-<90%
Turf 90%-100%
Emergent Vegetation 10%-<50%
Emergent Vegetation 50%-<90%
Emergent Vegetation 90%-100%
Uncolonized 50%-<90%
Uncolonized 90%-100%
Unclassified
Unknown
Minimum Mapping Unit (1 Acre)
0 0.5 1 1.5 km
mi 1 0.5 0

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 91)


157°4'30"W
Frame 90
Frame 92
21°11'N
21°11'N
157°4'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
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104
103
102
101
100
99
98
97
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

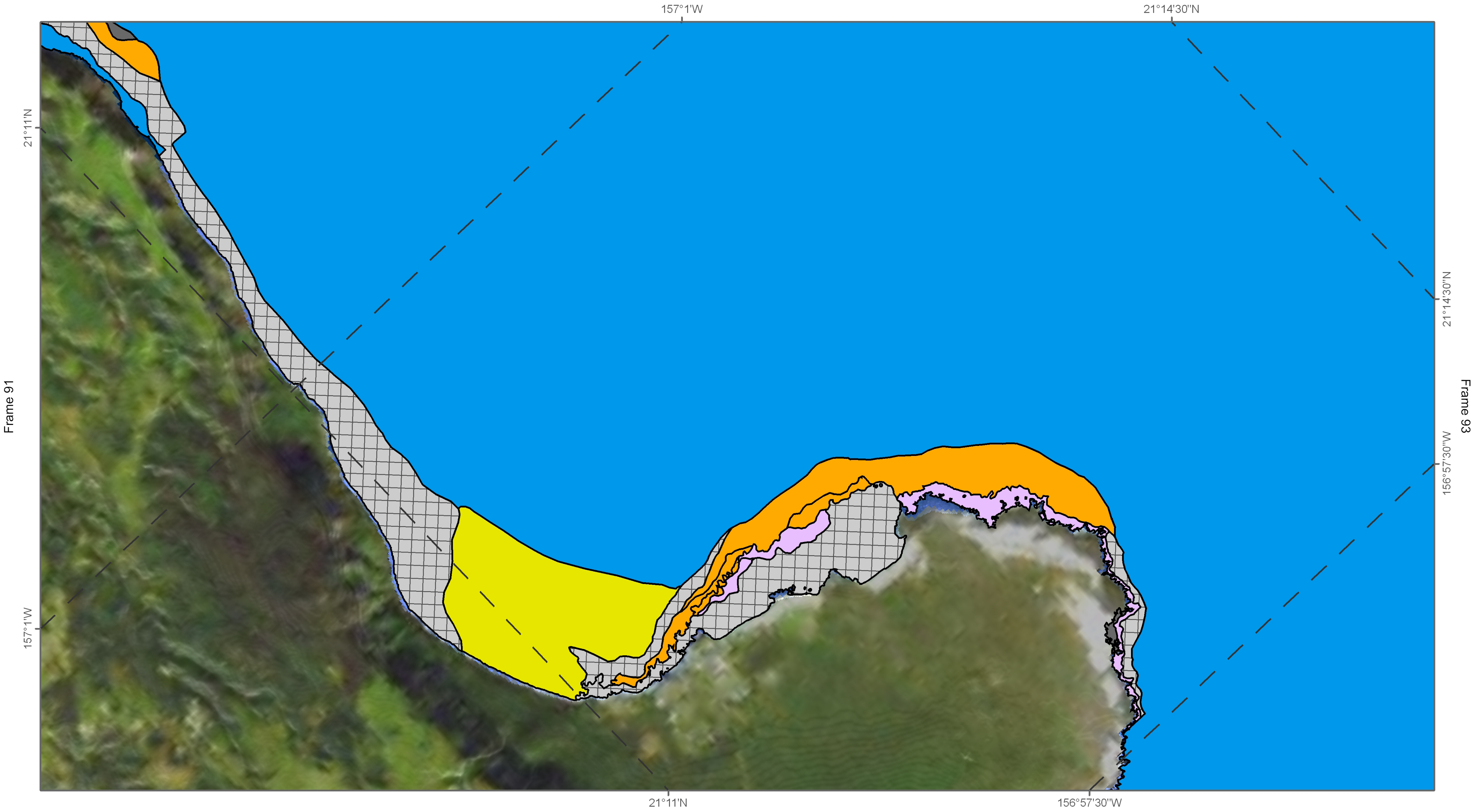
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 92)


157°1'W
21°14'30"N
21°11'N
157°1'W
Frame 91
21°14'30"N
156°57'30"W
Frame 93
21°11'N
156°57'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
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99
100
101
102
103
104
105
0 5 10
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

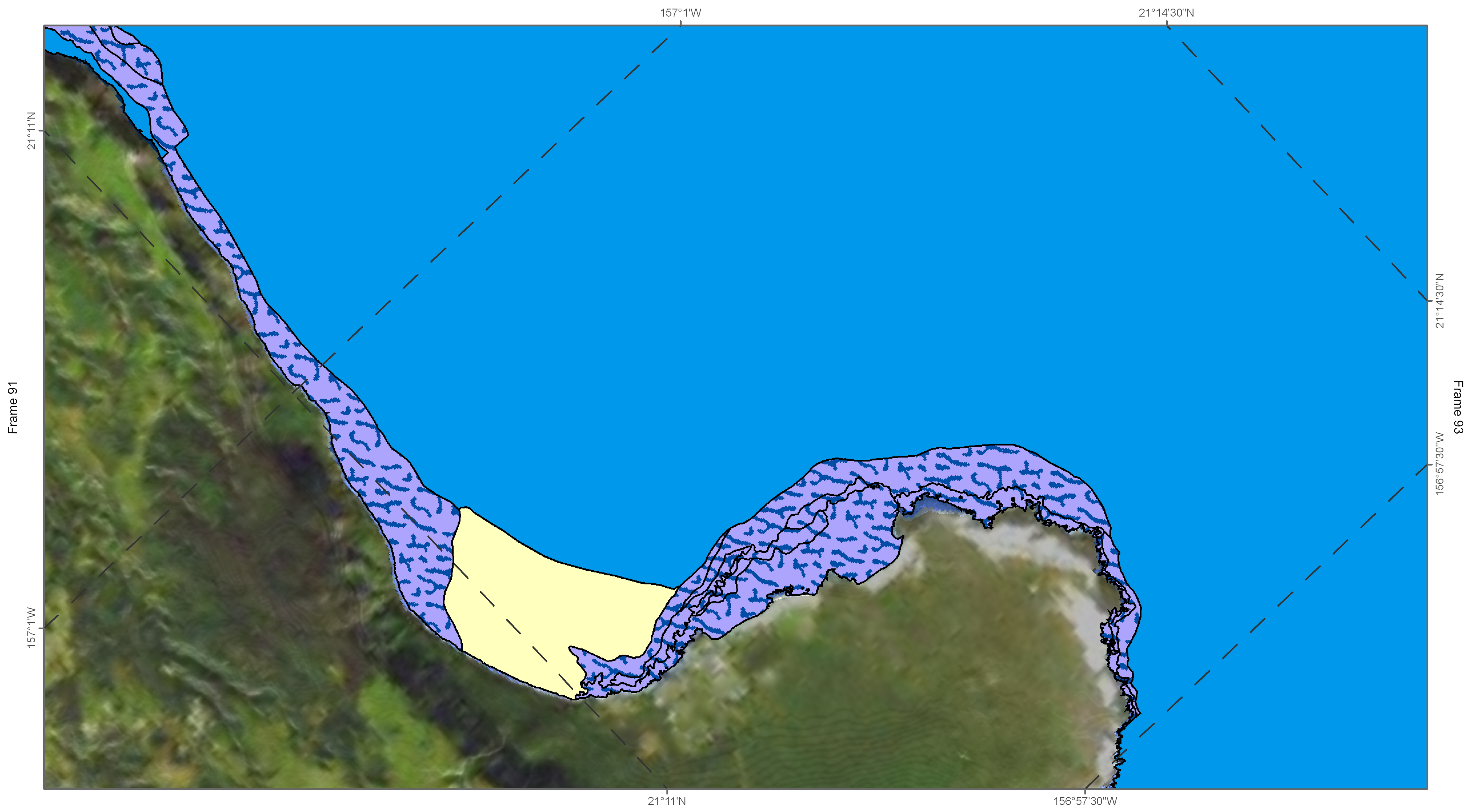
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 92)


157°1'W
21°14'30"N
21°11'N
157°1'W
Frame 91
21°14'30"N
Frame 93
156°57'30"W
21°11'N
156°57'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
90
91
92
93
94
95
105
96
104
103
102
101
100
99
98
97
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- 🟪 Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

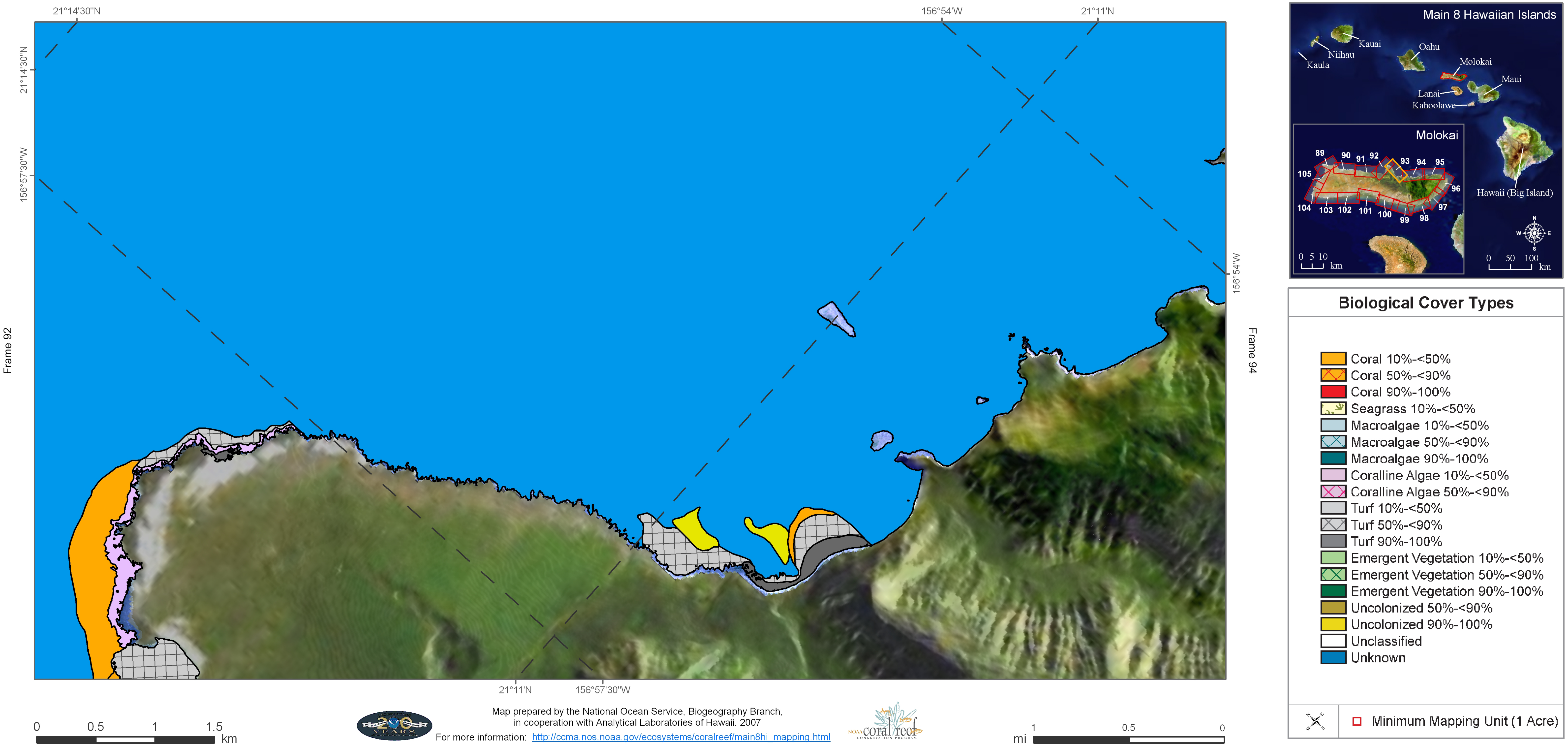
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 93)


21°14'30"N
156°54'W
21°11'N
21°14'30"N
156°57'30"W
156°54'W
Frame 92
Frame 94
21°11'N
156°57'30"W
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
90
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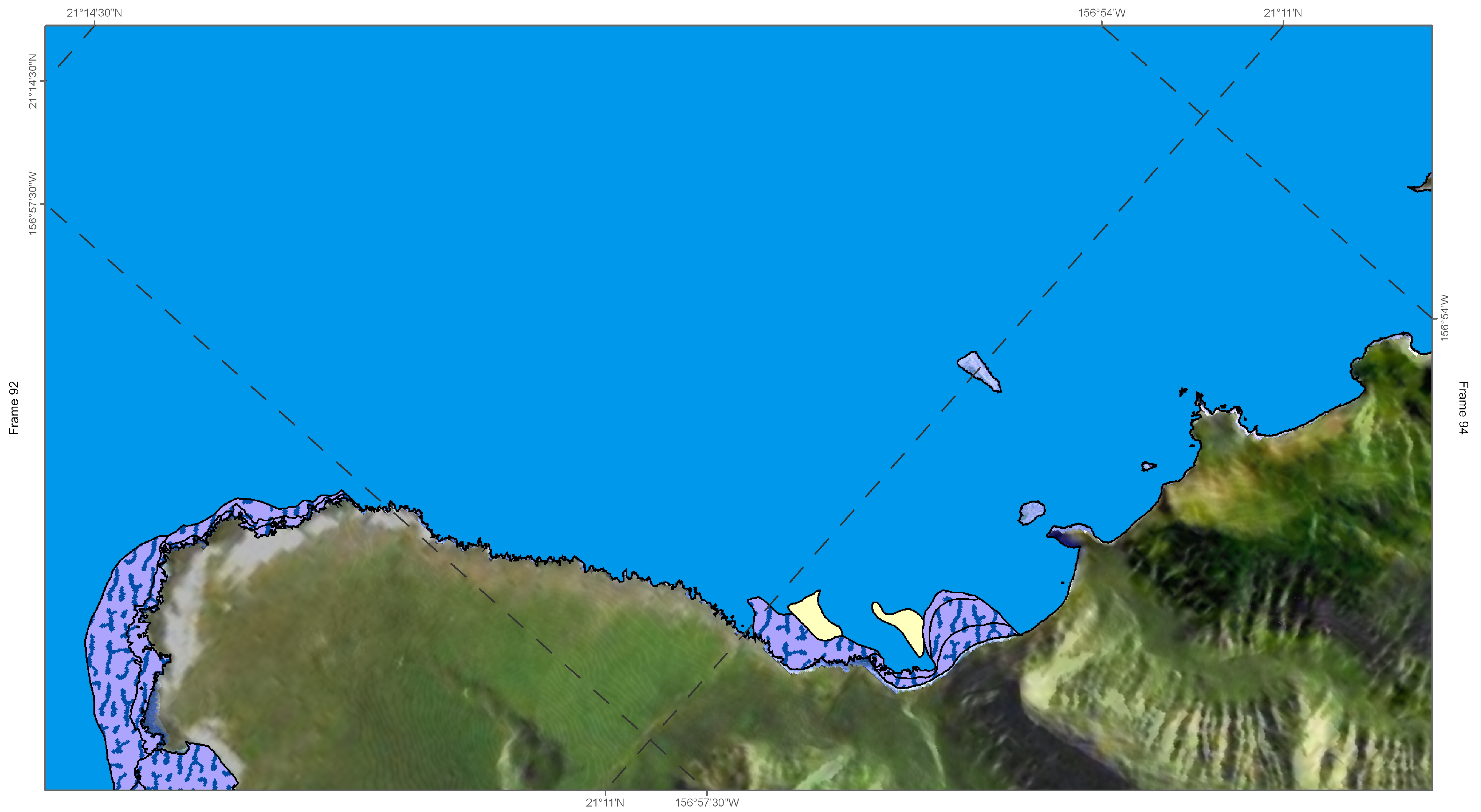
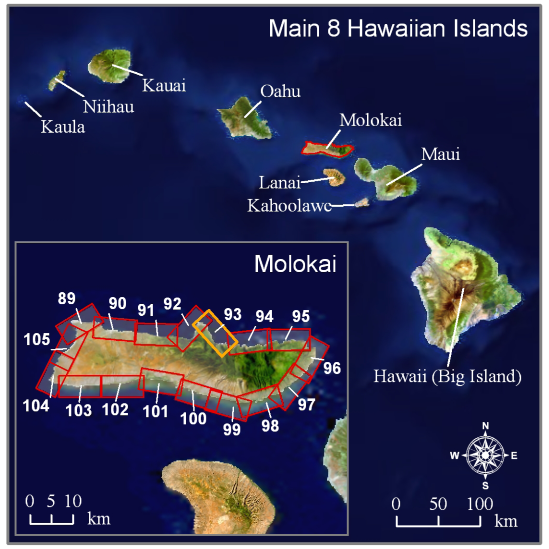
92
93
94
95
105
96
104
103
102
101
100
99
98
97
0 5 10 km
0 50 100 km
N
W
E
S
Biological Cover Types
Coral 10%-<50%
Coral 50%-<90%
Coral 90%-100%
Seagrass 10%-<50%
Macroalgae 10%-<50%
Macroalgae 50%-<90%
Macroalgae 90%-100%
Coralline Algae 10%-<50%
Coralline Algae 50%-<90%
Turf 10%-<50%
Turf 50%-<90%
Turf 90%-100%
Emergent Vegetation 10%-<50%
Emergent Vegetation 50%-<90%
Emergent Vegetation 90%-100%
Uncolonized 50%-<90%
Uncolonized 90%-100%
Unclassified
Unknown
Minimum Mapping Unit (1 Acre)
0 0.5 1 1.5 km
mi 1 0.5 0

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 93)


21°14'30"N
156°54'W
21°11'N
21°14'30"N
156°57'30"W
156°54'W
Frame 92
Frame 94
21°11'N
156°57'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
90
91
92
93
94
95
105
96
104
103
102
101
100
99
98
97
0 5 10
km
N
W
E
S
0 50 100
km

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

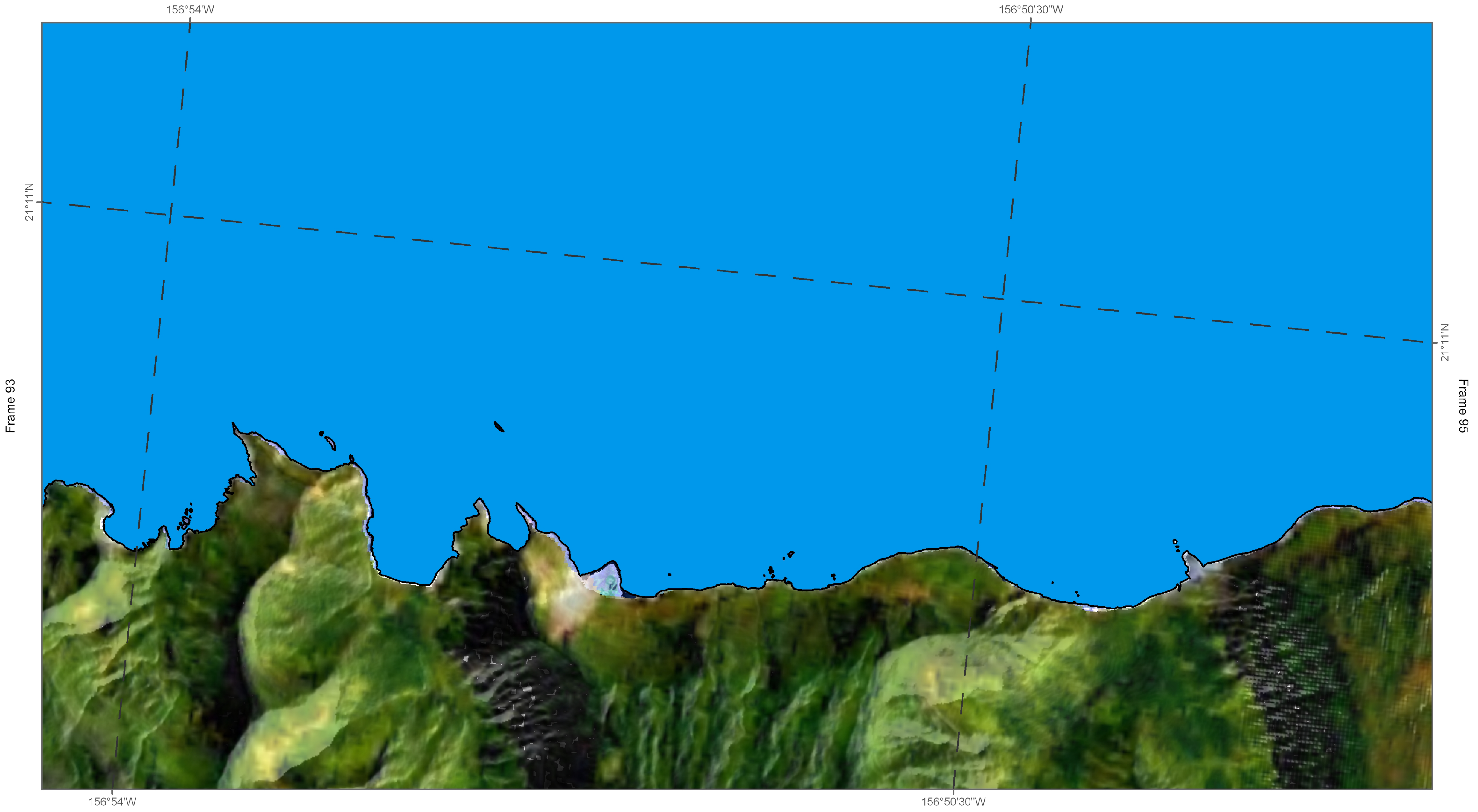
☐ Minimum Mapping Unit (1 Acre)

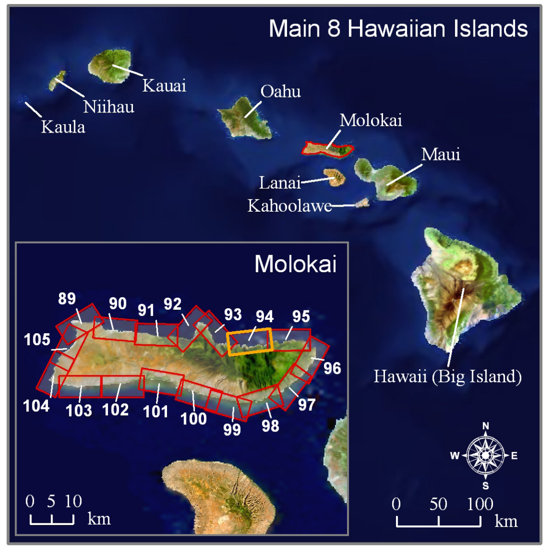
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 94)


156°54'W
156°50'30"W
21°11'N
21°11'N
Frame 93
Frame 95
156°54'W
156°50'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
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104
103
102
101
100
99
98
97
0 5 10
km
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

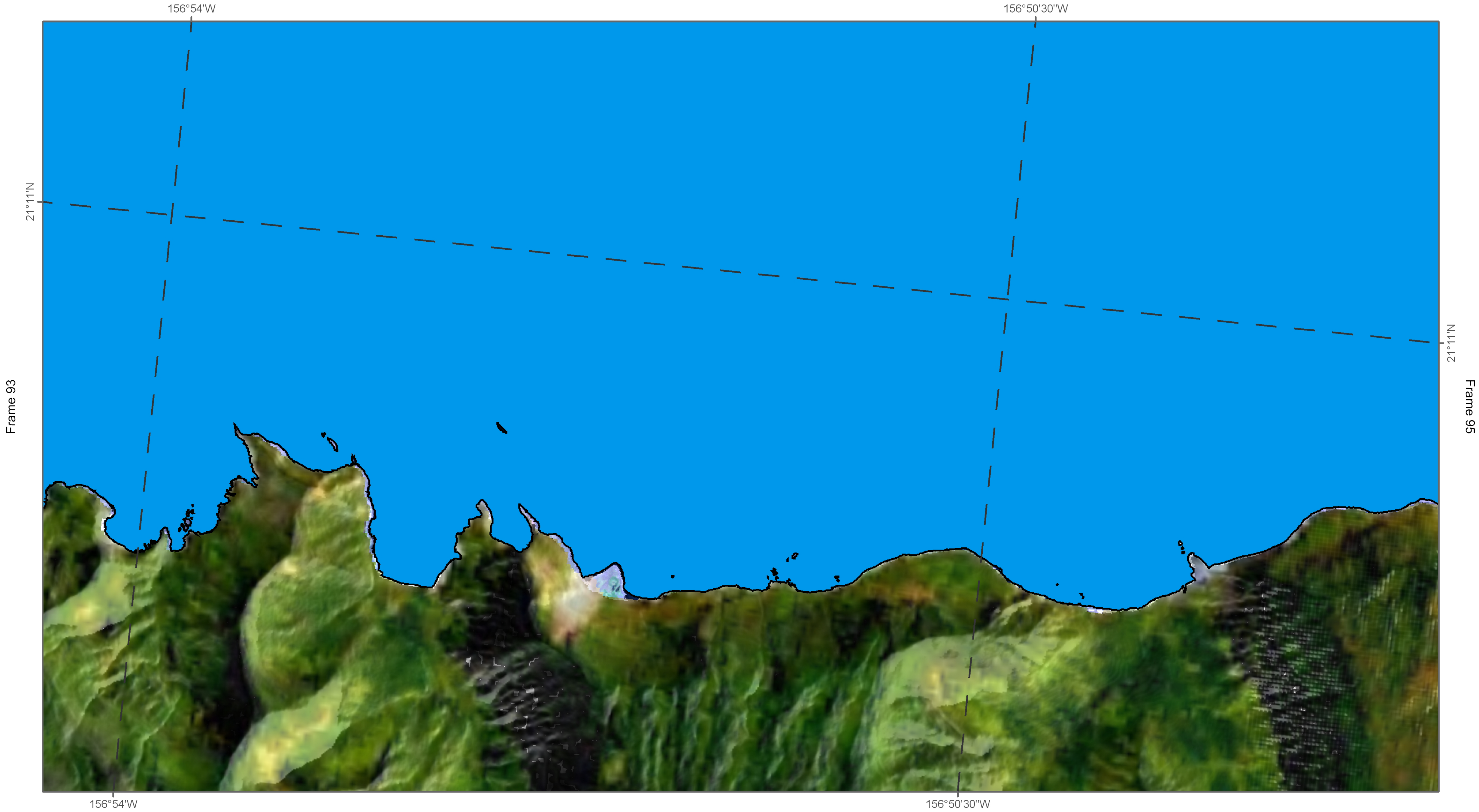
☐ Minimum Mapping Unit (1 Acre)

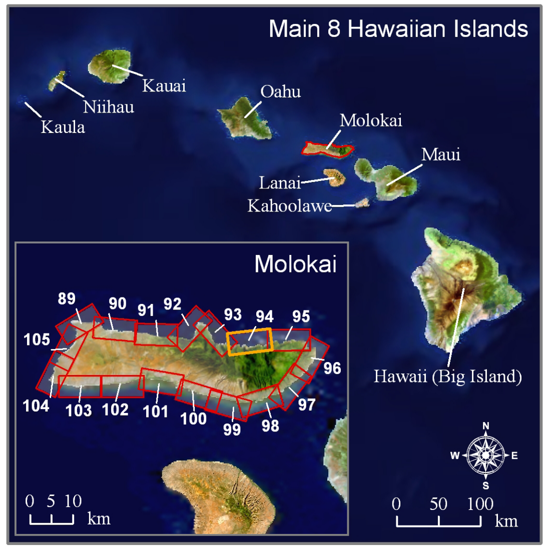
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 94)


156°54'W
156°50'30"W
21°11'N
21°11'N
Frame 93
Frame 95
156°54'W
156°50'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
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103
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101
100
99
98
97
0 5 10
km
N
W
E
S
0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

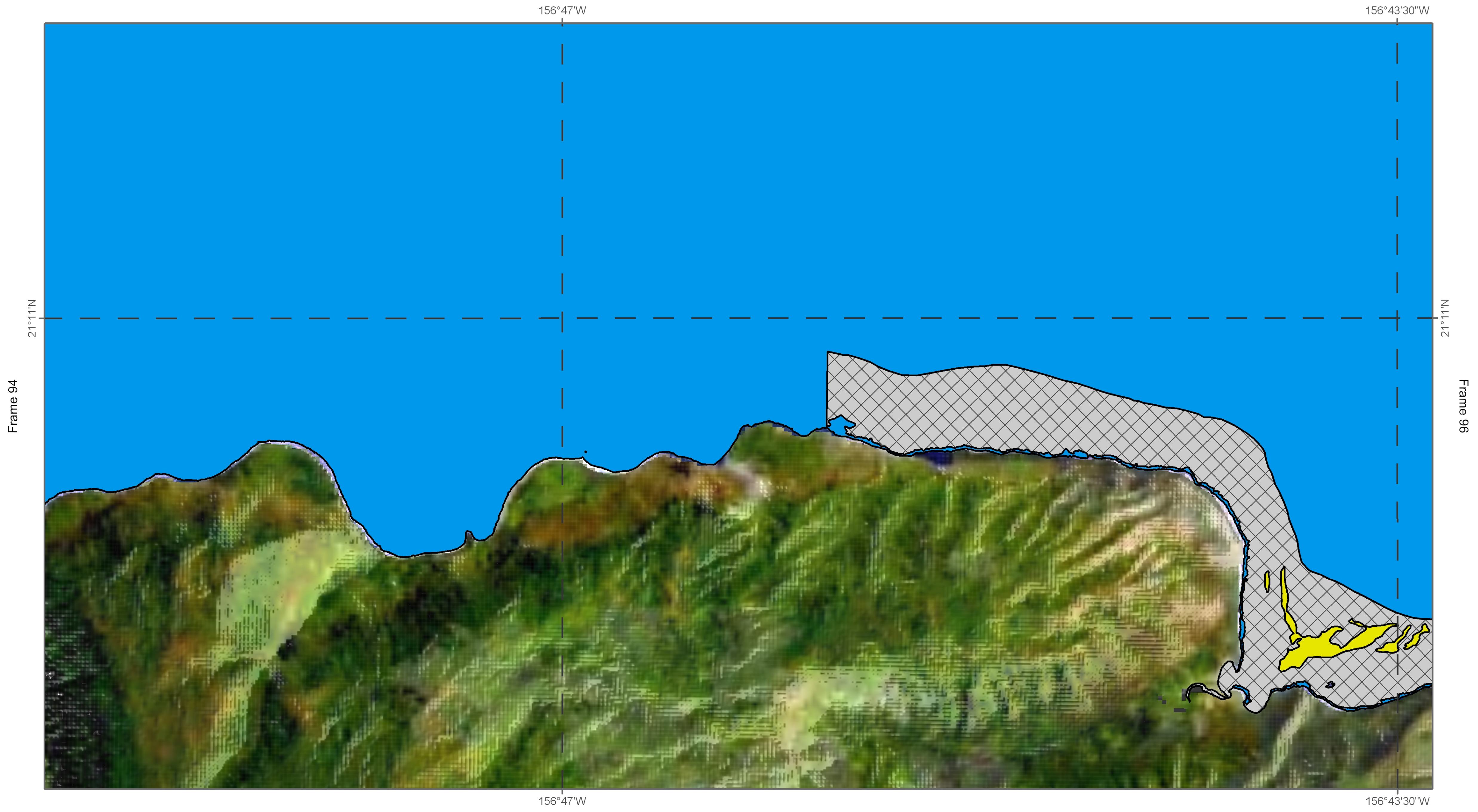
□ Minimum Mapping Unit (1 Acre)

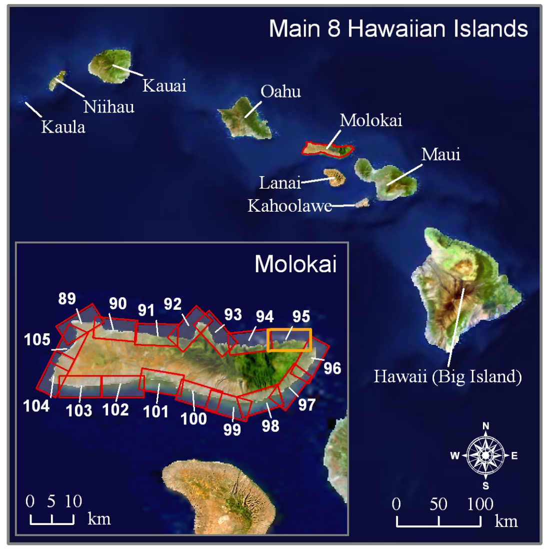
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 95)


156°47'W
156°43'30"W
21°11'N
21°11'N
Frame 94
Frame 96
156°47'W
156°43'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
90
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99
100
101
102
103
104
105
0 5 10
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

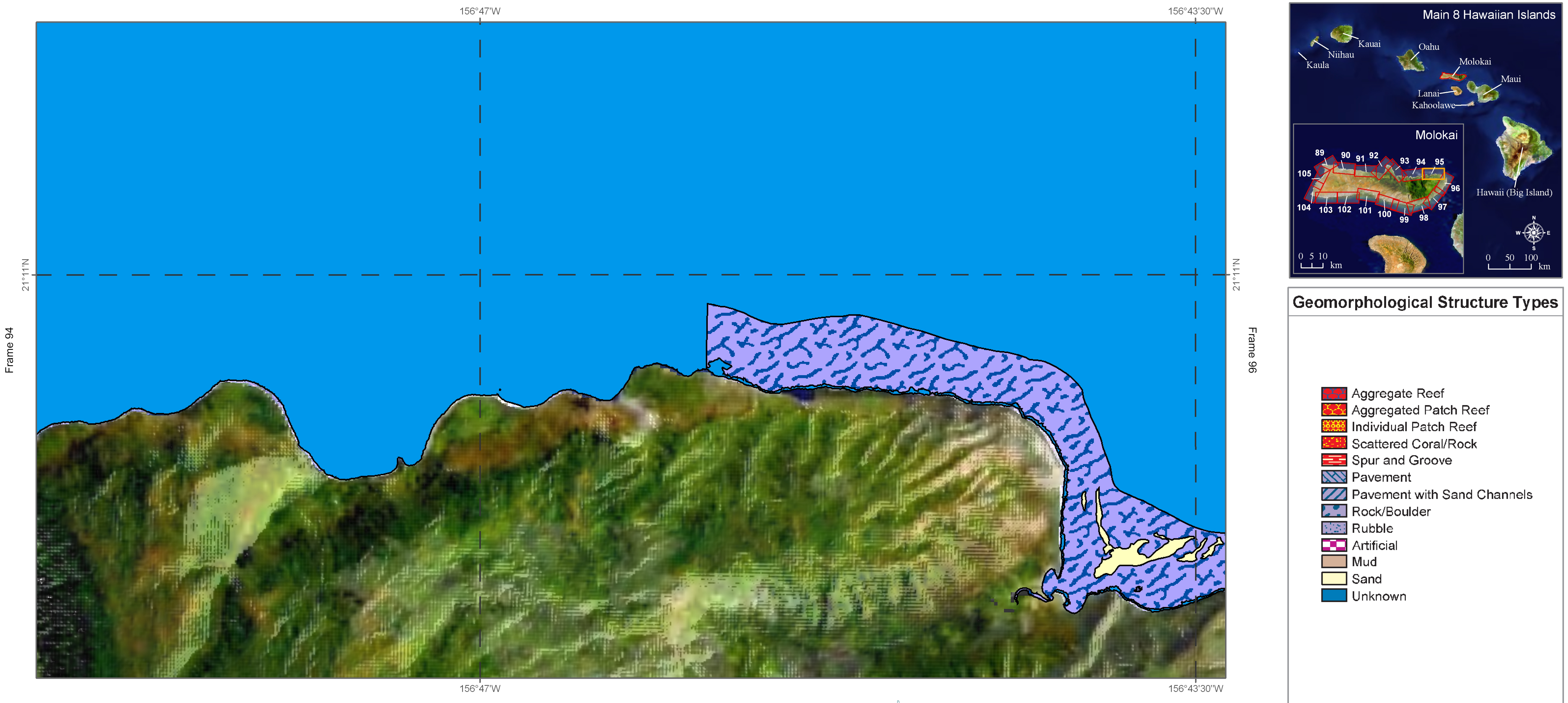
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 95)


156°47'W
156°43'30"W
21°11'N
Frame 94
Frame 96
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Molokai
89 90 91 92 93 94 95
105
96
104 103 102 101 100 99 98 97
0 5 10 km
N
W E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

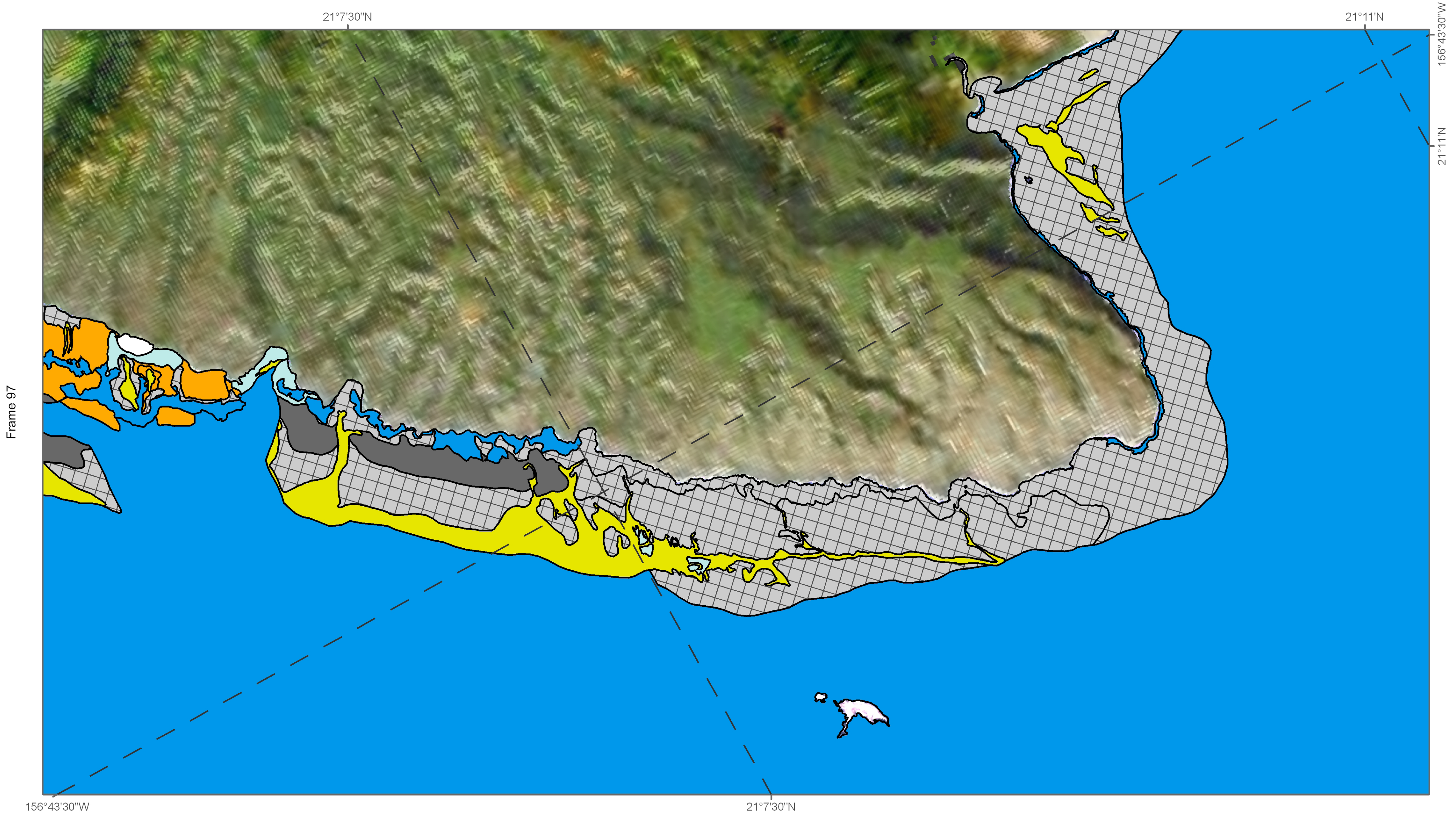
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 96)


21°7'30"N
21°11'N
156°43'30"W
21°11'N
Frame 97
156°43'30"W
21°7'30"N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Molokai
89
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95
105
96
104
103
102
101
100
99
98
97
Hawaii (Big Island)
N
W
E
S
0 5 10
km
0 50 100
km

Biological Cover Types

- ■ Coral 10%-<50%
- ▨ Coral 50%-<90%
- ■ Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- ■ Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- ■ Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- ■ Uncolonized 90%-100%
- □ Unclassified
- ■ Unknown

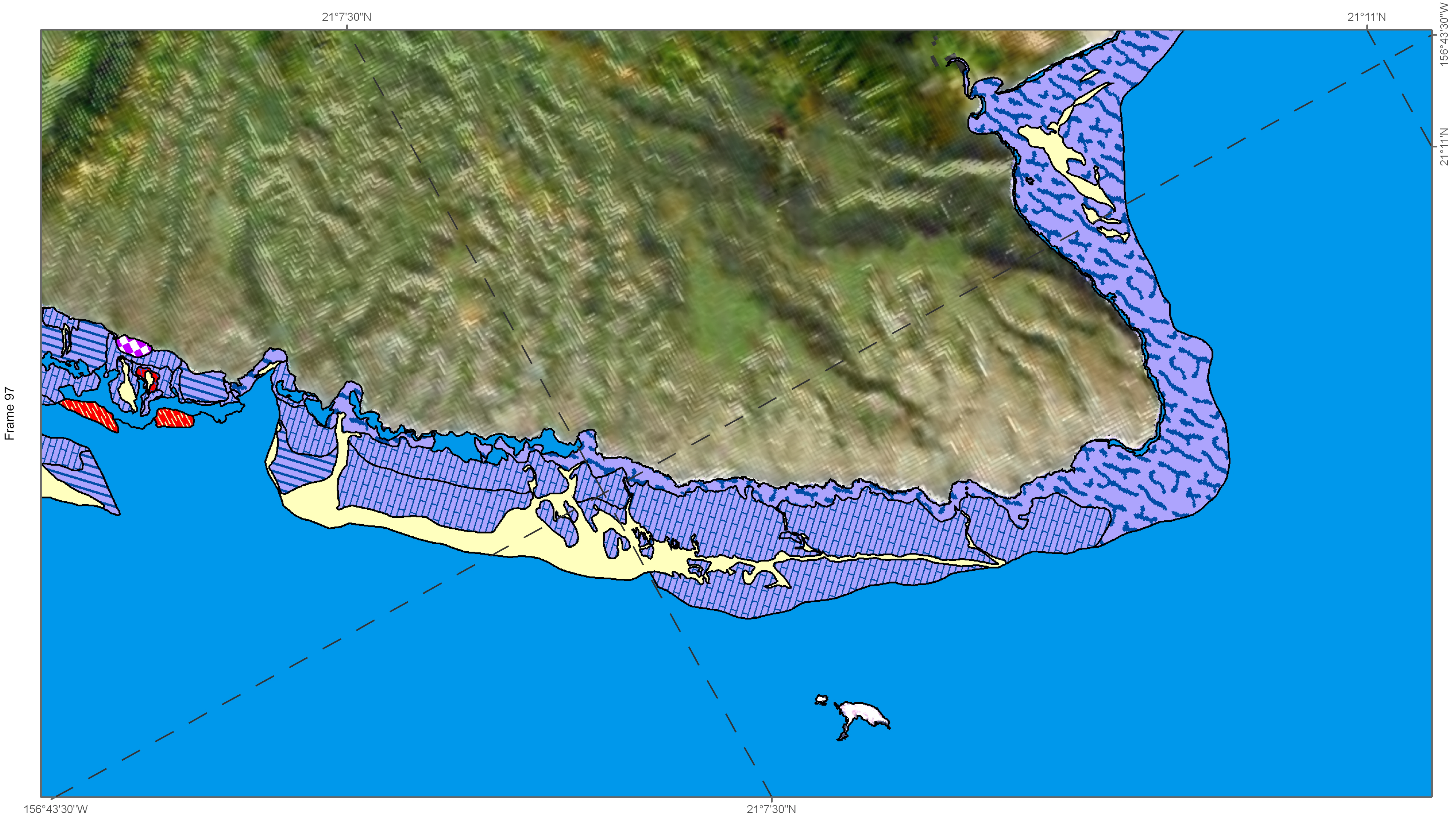
□ Minimum Mapping Unit (1 Acre)

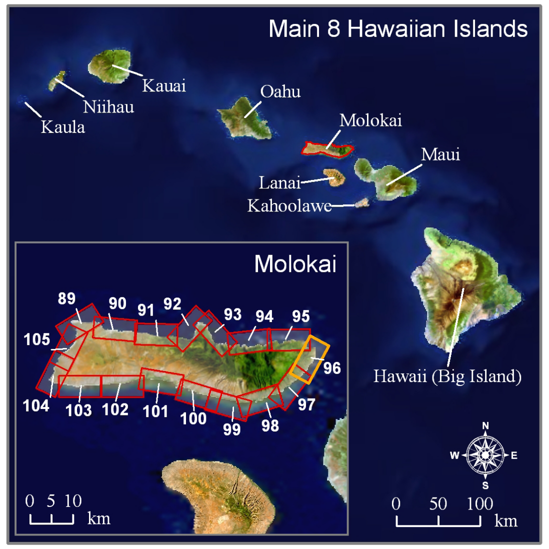
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 96)


21°7'30"N
21°11'N
156°43'30"W
21°11'N
Frame 97
156°43'30"W
21°7'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
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104
103
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101
100
99
98
97
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

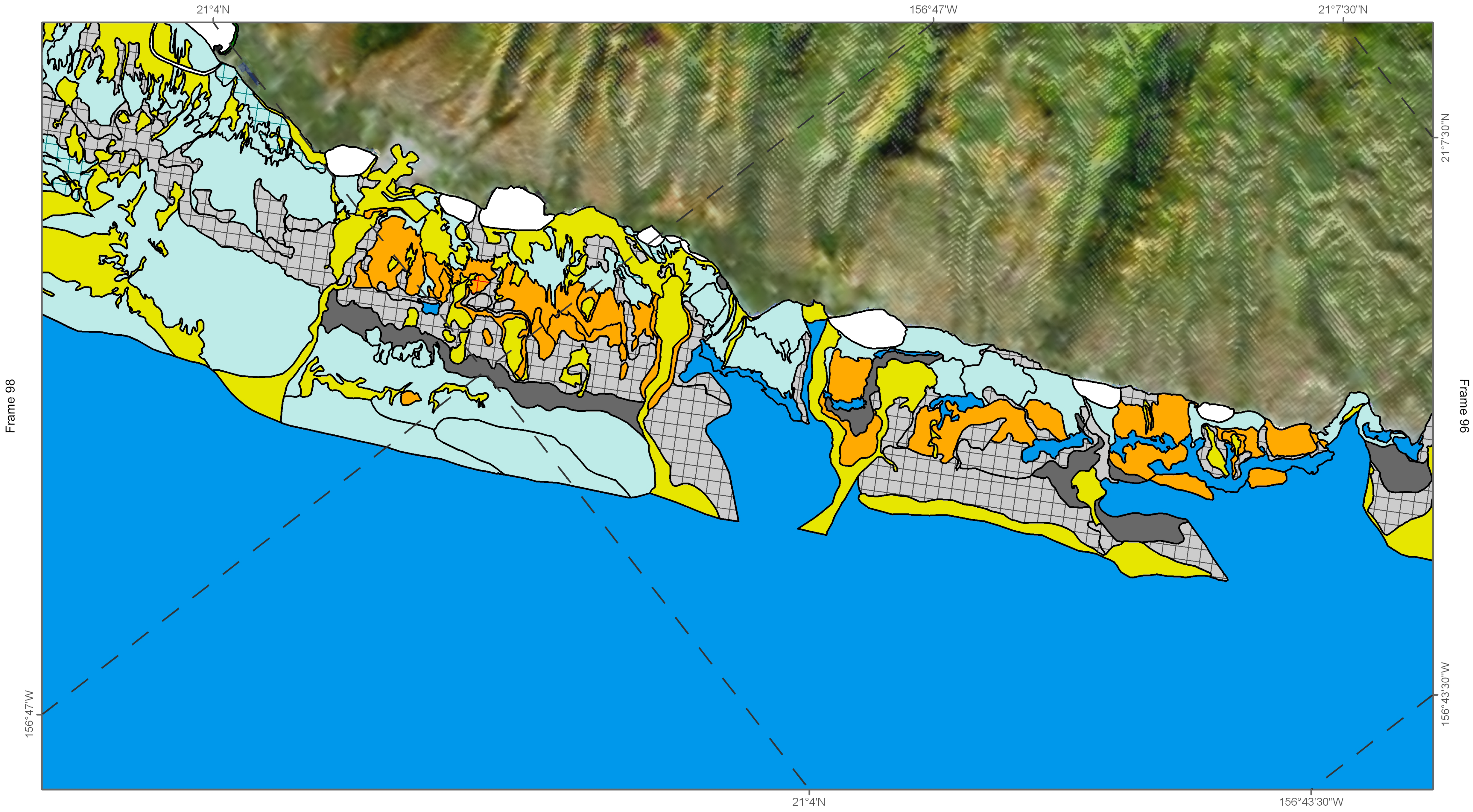
□ Minimum Mapping Unit (1 Acre)

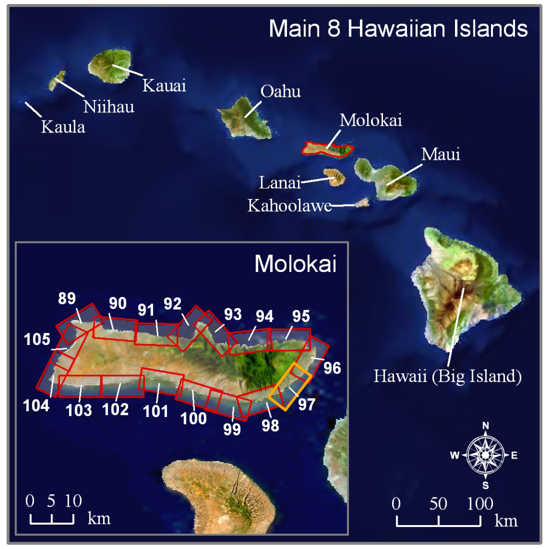
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 97)


21°4'N
156°47'W
21°7'30"N
21°7'30"N
Frame 98
Frame 96
156°47'W
156°43'30"W
21°4'N
156°43'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
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103
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101
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99
98
97
0 5 10
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

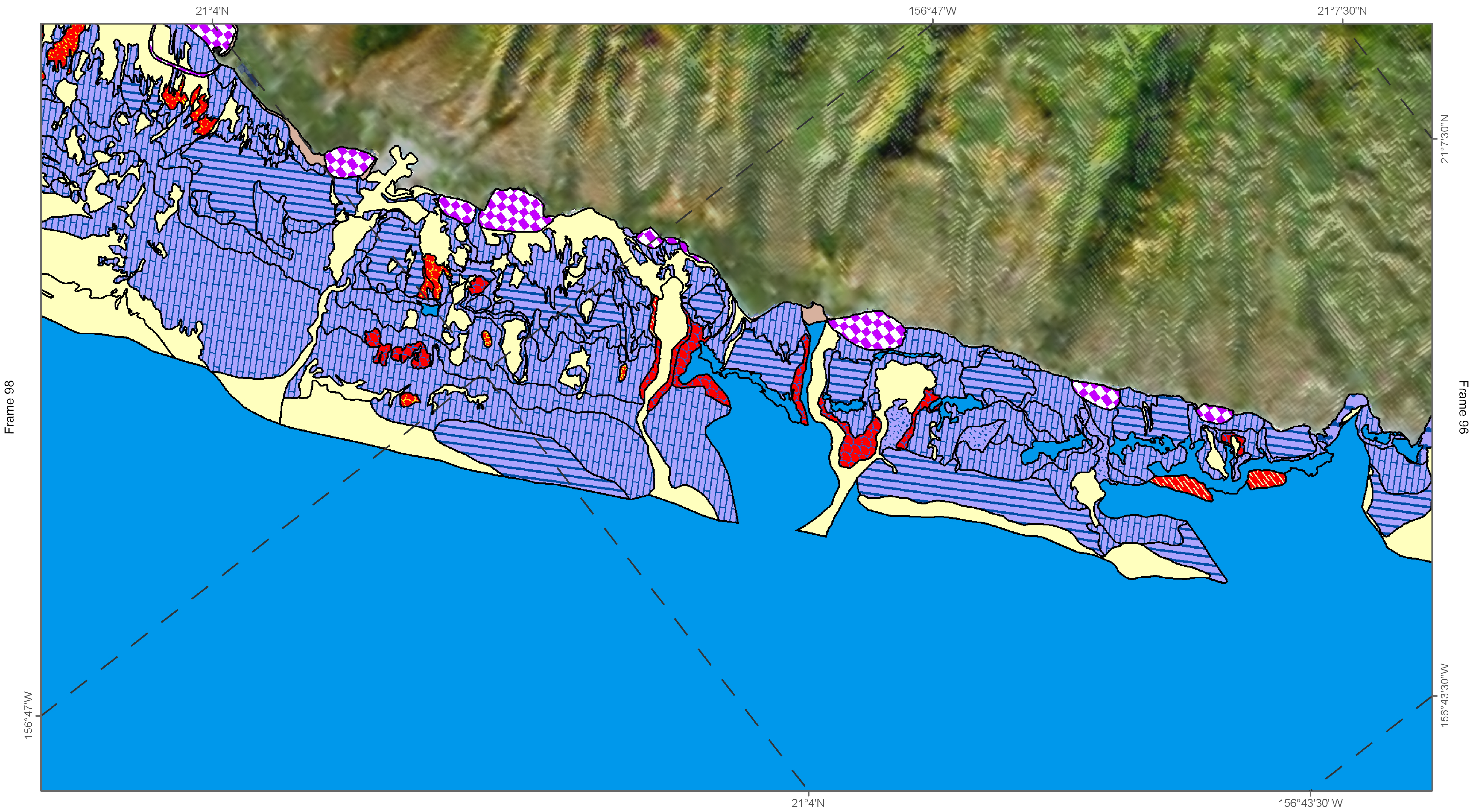
☐ Minimum Mapping Unit (1 Acre)

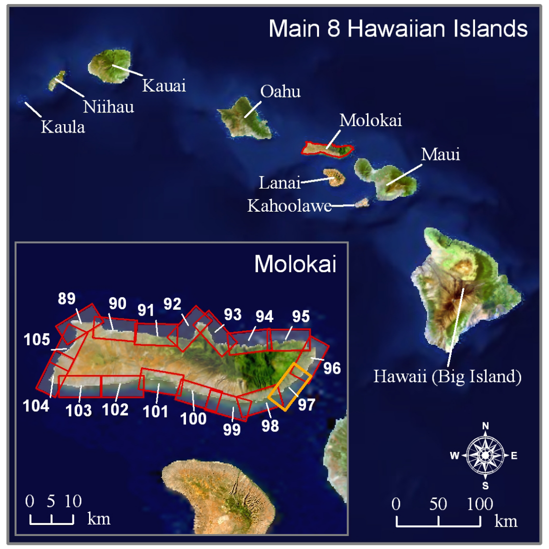
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 97)


21°4'N
156°47'W
21°7'30"N
21°7'30"N
Frame 98
Frame 96
156°47'W
156°43'30"W
21°4'N
156°43'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
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105
96
104
103
102
101
100
99
98
97
0 5 10
km
N
W
E
S
0 50 100
km

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

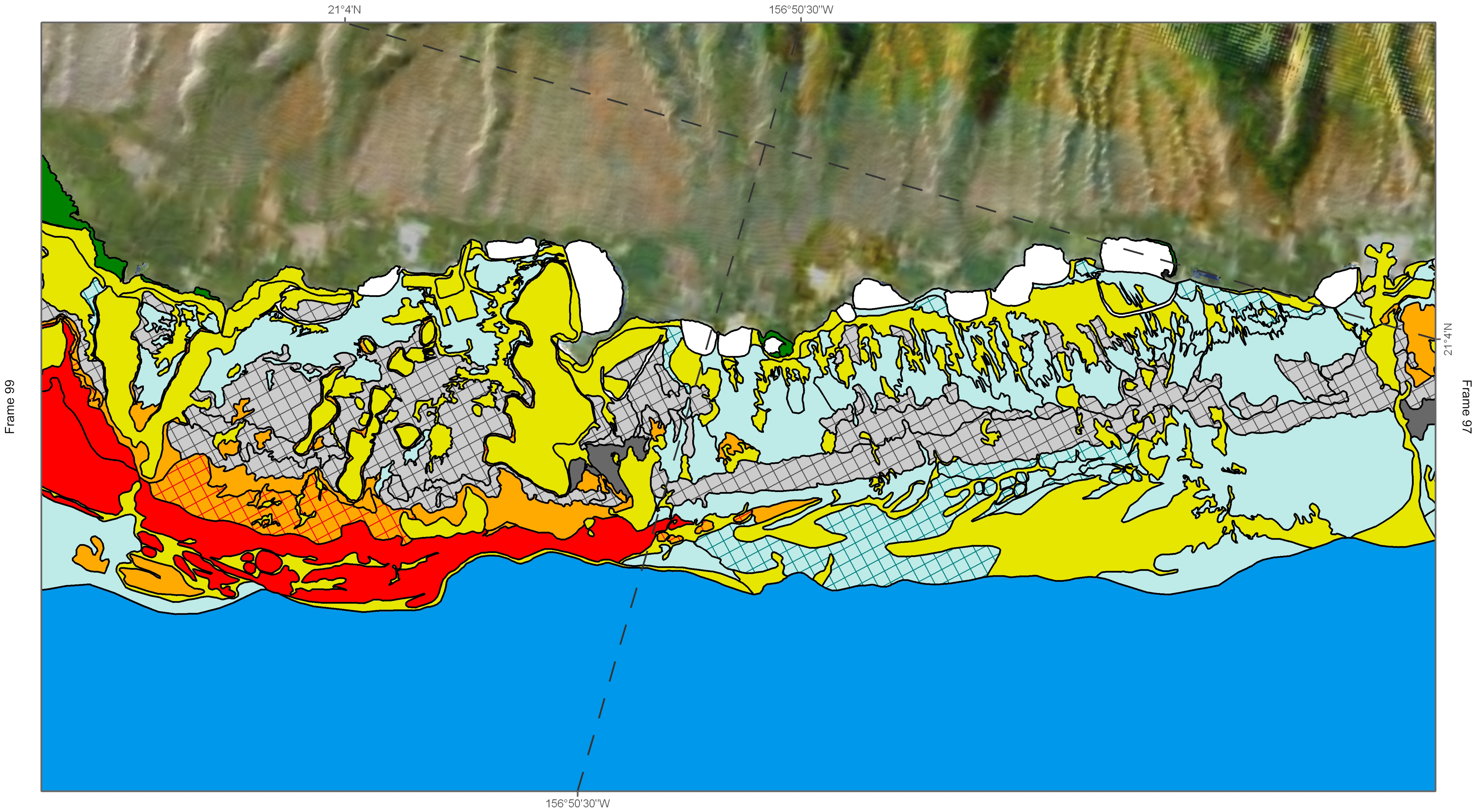
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 98)


21°4'N
156°50'30"W
21°4'N
Frame 99
Frame 97
156°50'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
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105
96
104
103
102
101
100
99
98
97
0 5 10
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- □ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- □ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- □ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- □ Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- ■ Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

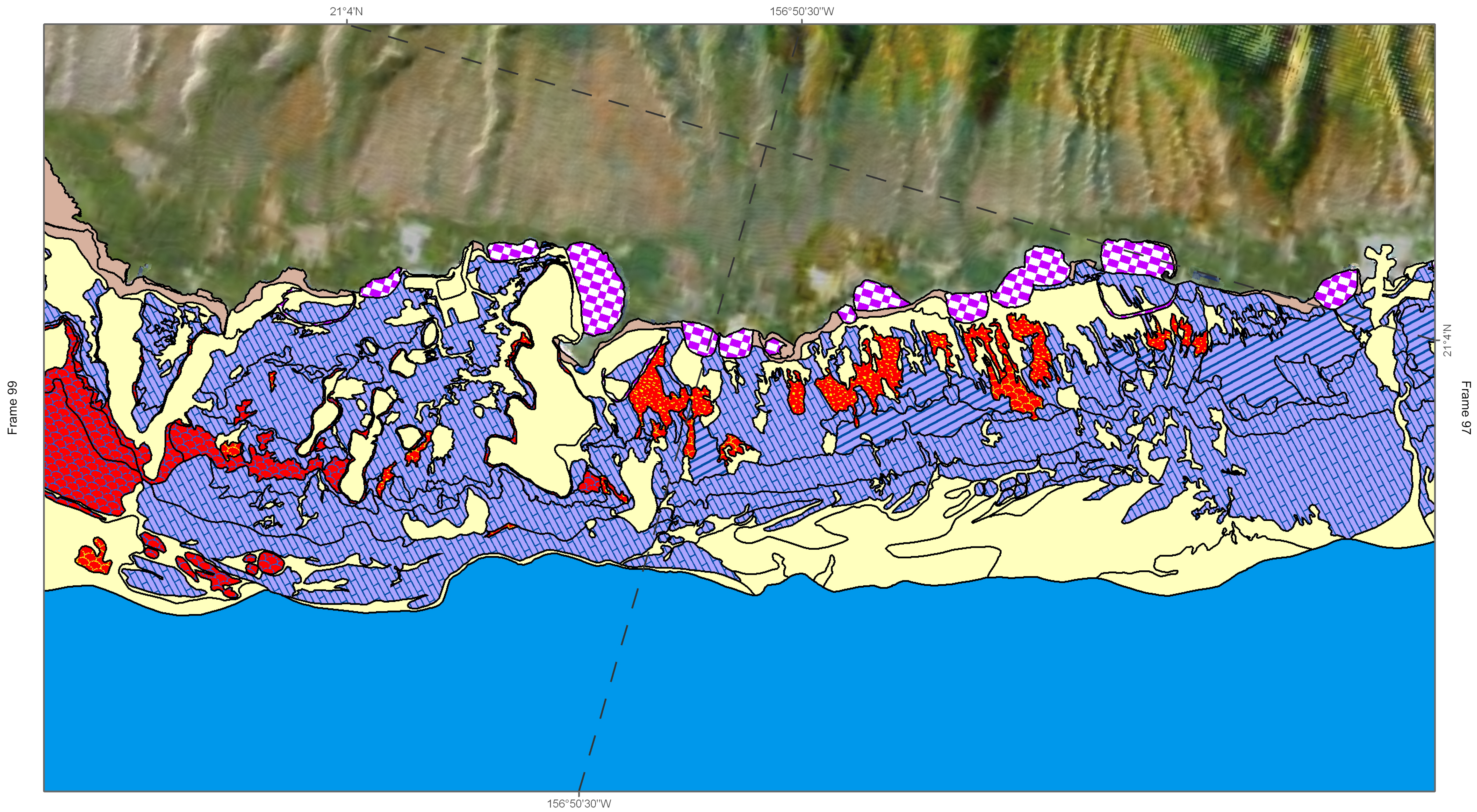
□ Minimum Mapping Unit (1 Acre)

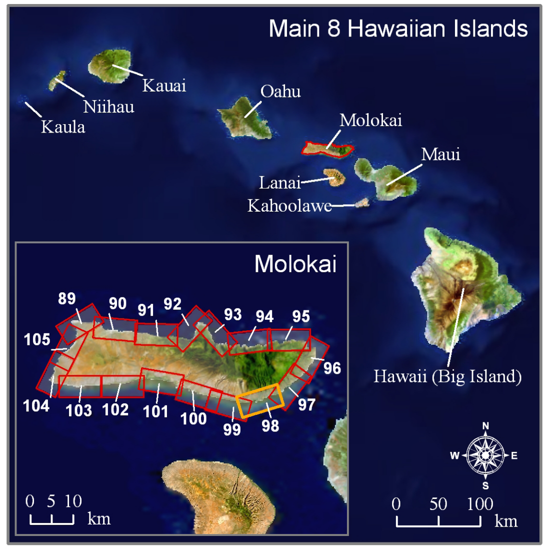
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 98)


21°4'N
156°50'30"W
21°4'N
Frame 99
Frame 97
156°50'30"W
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0
50
100
km
Molokai
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
0
5
10
km

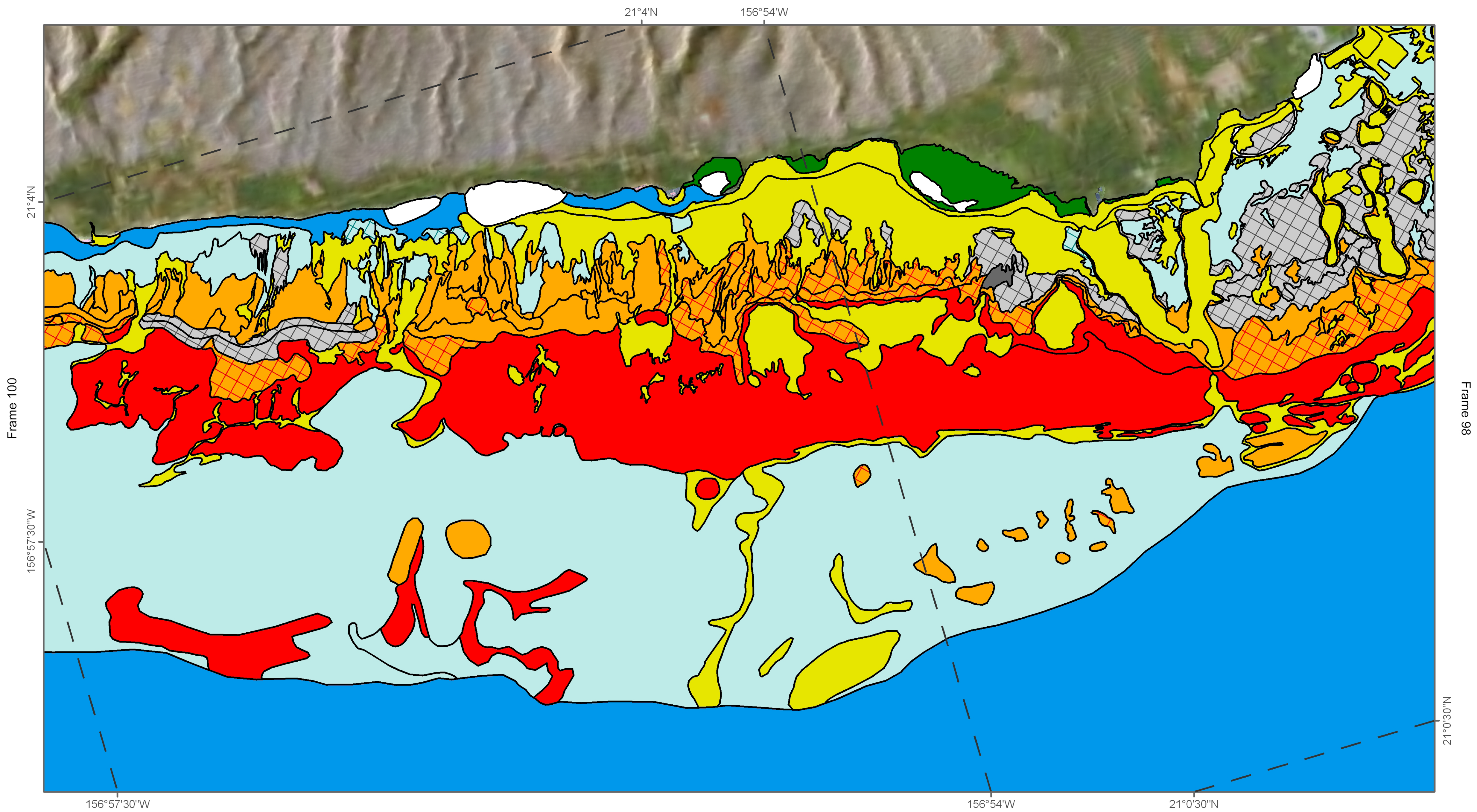
Geomorphological Structure Types

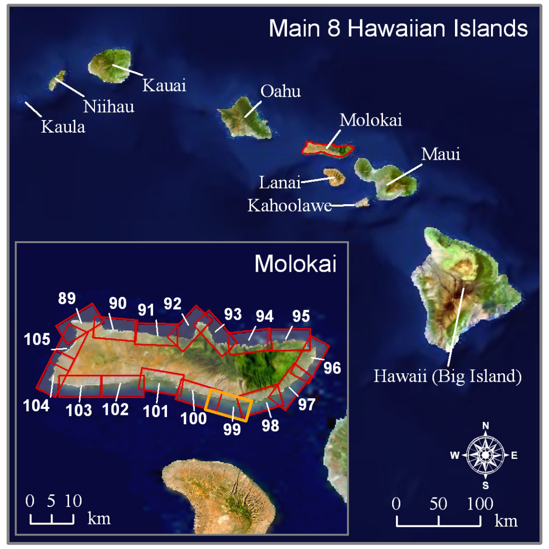
- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 99)


21°4'N
156°54'W
21°4'N
156°57'30"W
Frame 100
Frame 98
21°0'30"N
156°57'30"W
156°54'W
21°0'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
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101
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103
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105
0 5 10
km
0 50 100
km
N
S
E
W

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ☐ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ☐ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ☐ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

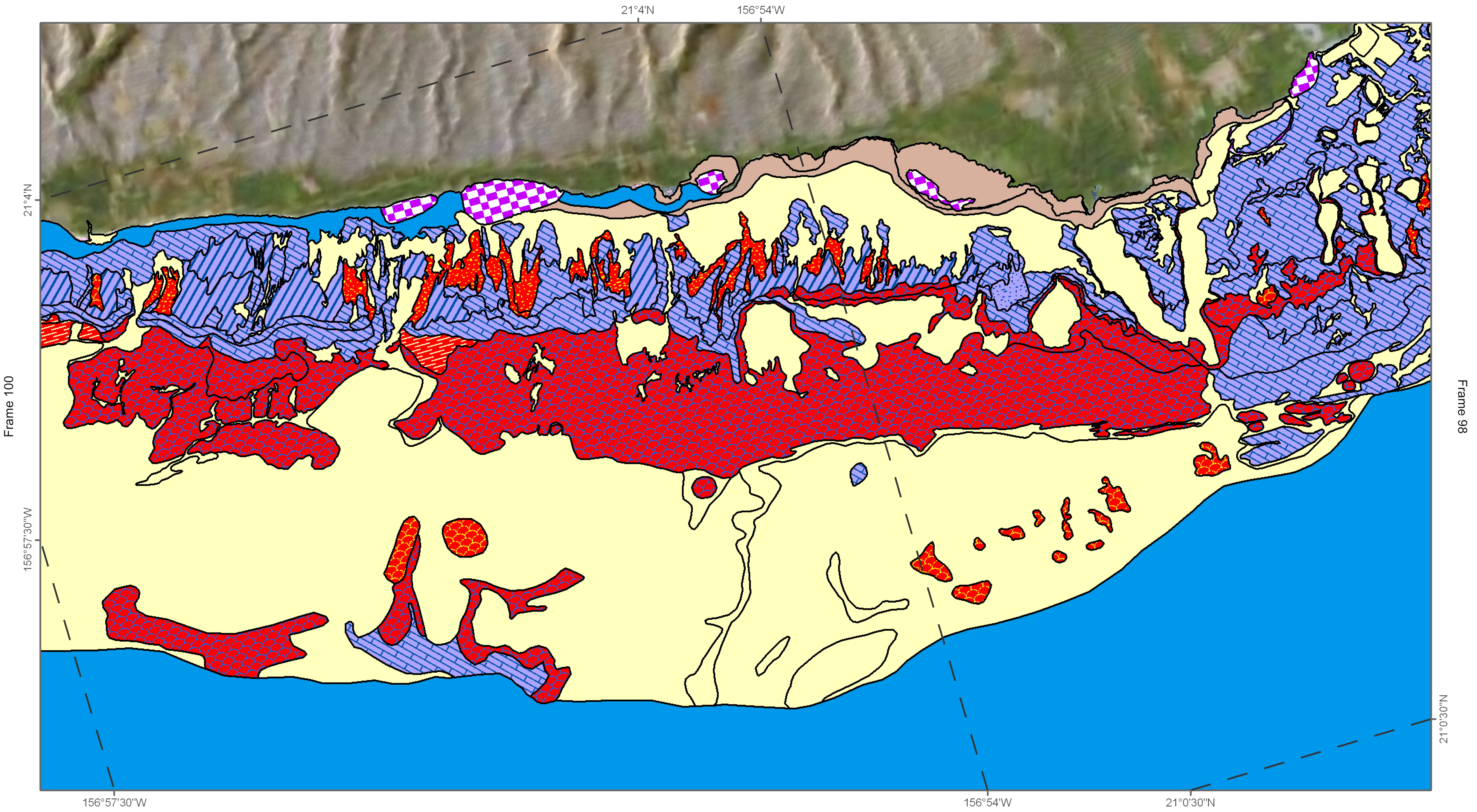
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

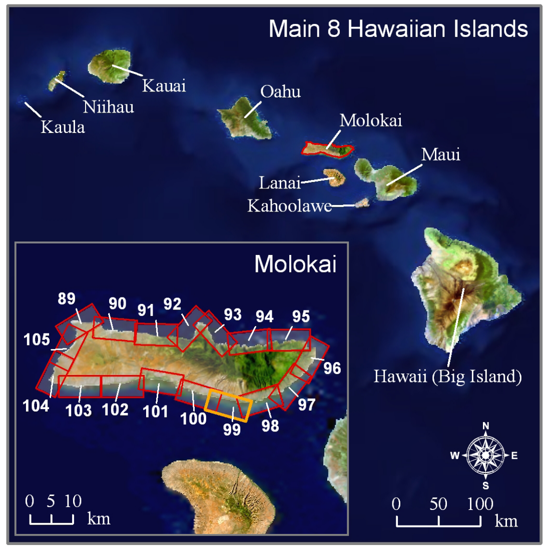
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 99)



21°4'N
156°54'W
21°4'N
Frame 100
156°57'30"W
Frame 98
21°0'30"N
156°57'30"W
156°54'W
21°0'30"N



Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Molokai
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
0 5 10 km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

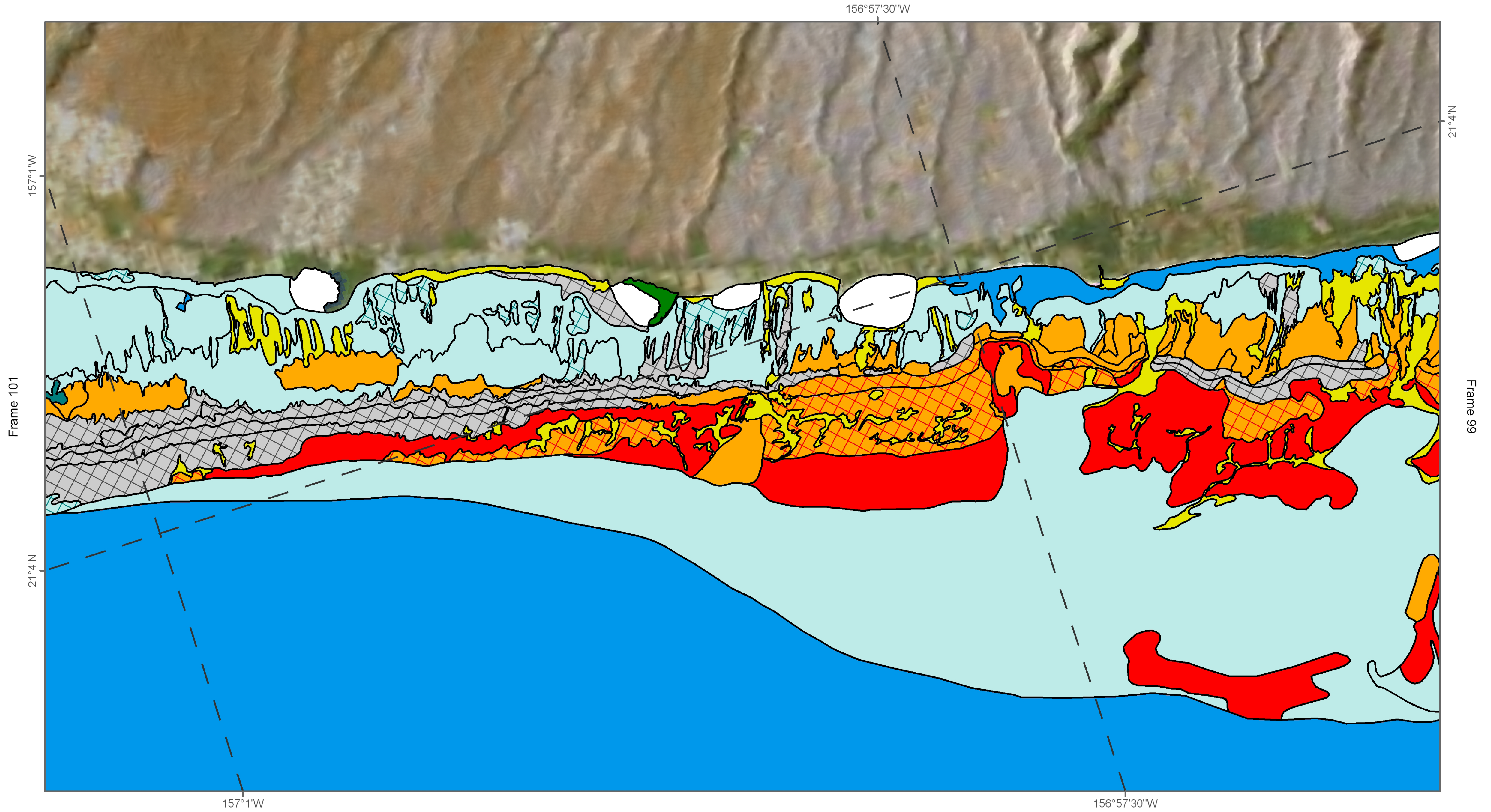
□ Minimum Mapping Unit (1 Acre)

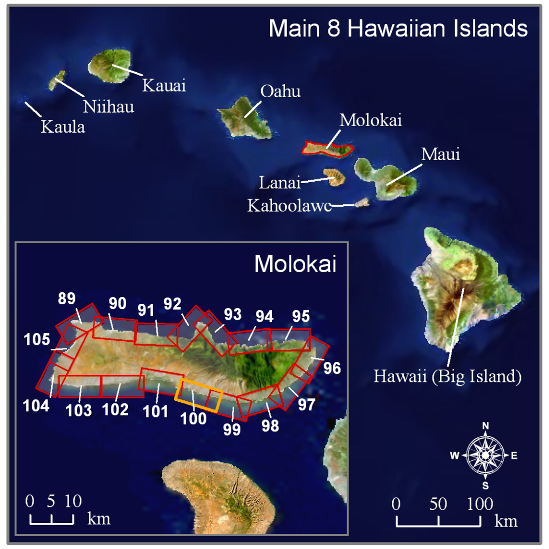
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 100)


156°57'30"W
157°1'W
21°4'N
Frame 101
Frame 99
21°4'N
157°1'W
156°57'30"W


Main 8 Hawaiian Islands
Kauai
Oahu
Niihau
Kaula
Molokai
Maui
Lanai
Kahoolawe
Molokai
89
90
91
92
93
94
95
105
96
104
103
102
101
100
99
98
97
Hawaii (Big Island)
N
W
E
S
0 5 10
km
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

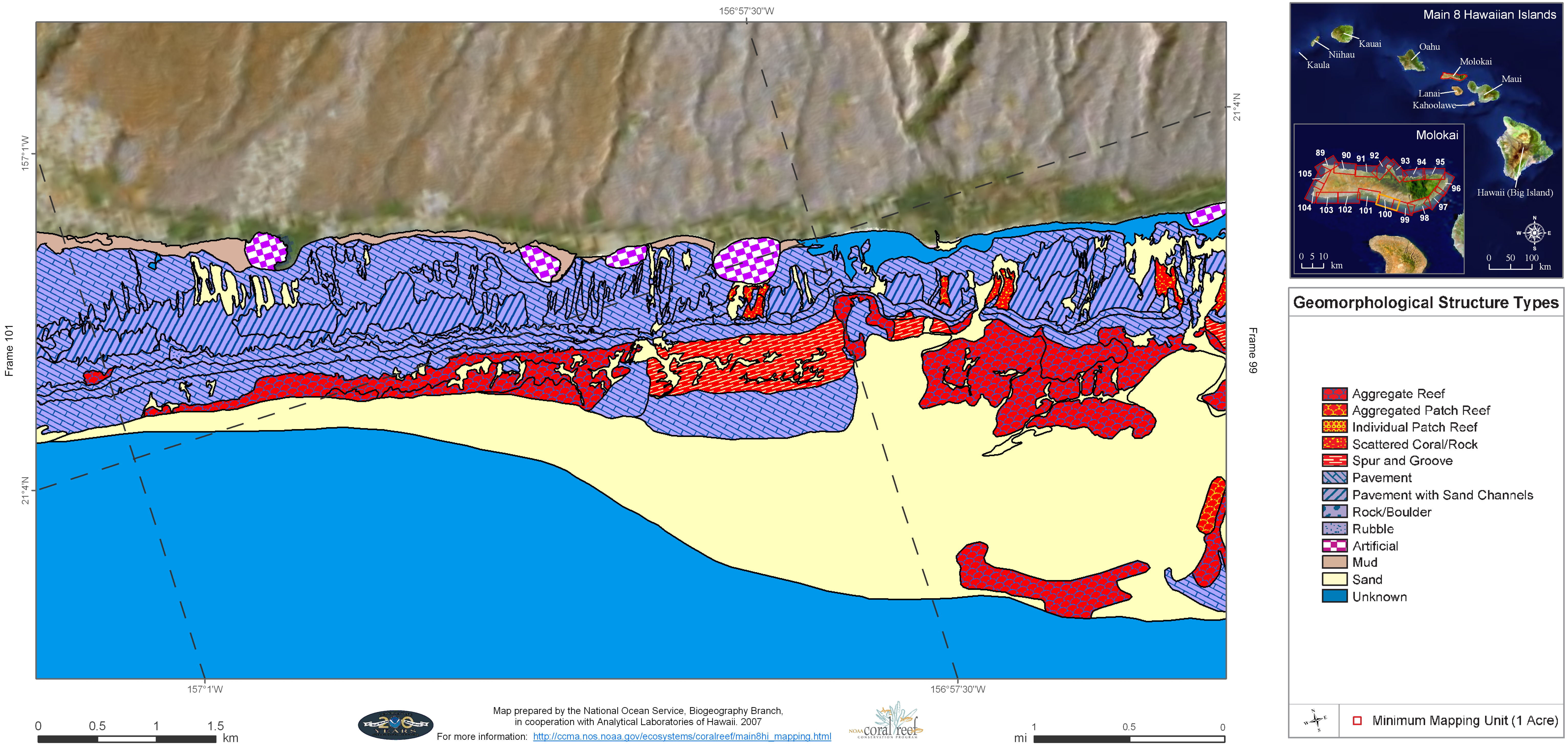
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

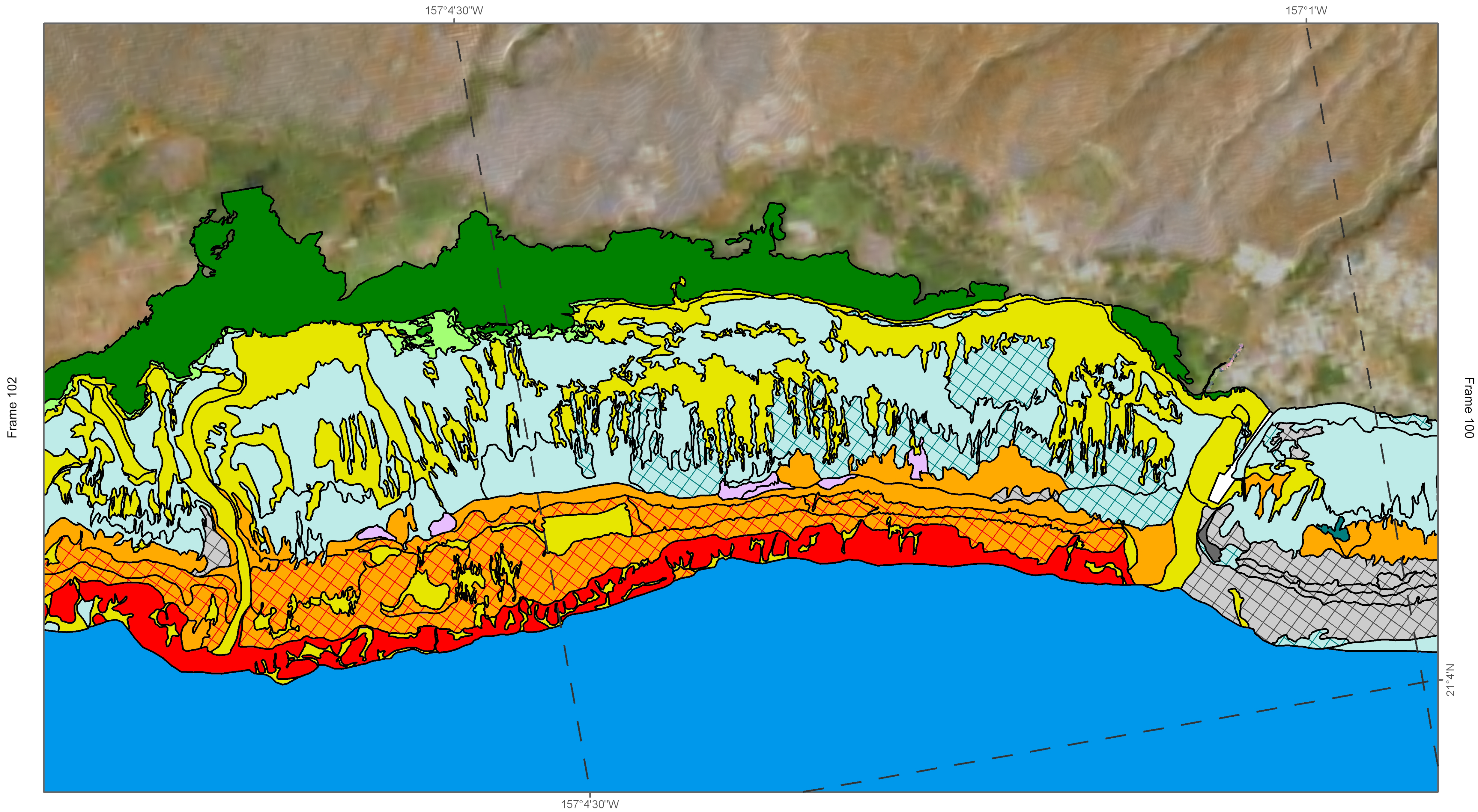
Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 100)

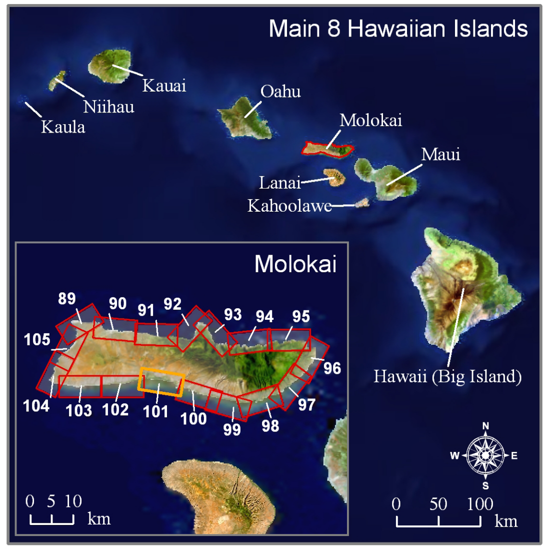

156°57'30"W
157°1'W
21°4'N
21°4'N
157°1'W
156°57'30"W
Frame 101
Frame 99
0 0.5 1 1.5 km
1 0.5 0 mi
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Molokai
89 90 91 92 93 94 95
105
96
104 103 102 101 100 99 98 97
0 5 10 km
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007

For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 101)


157°4'30"W
157°1'W
Frame 102
Frame 100
21°4'N
157°4'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
90
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105
96
104
103
102
101
100
99
98
97
0 5 10
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

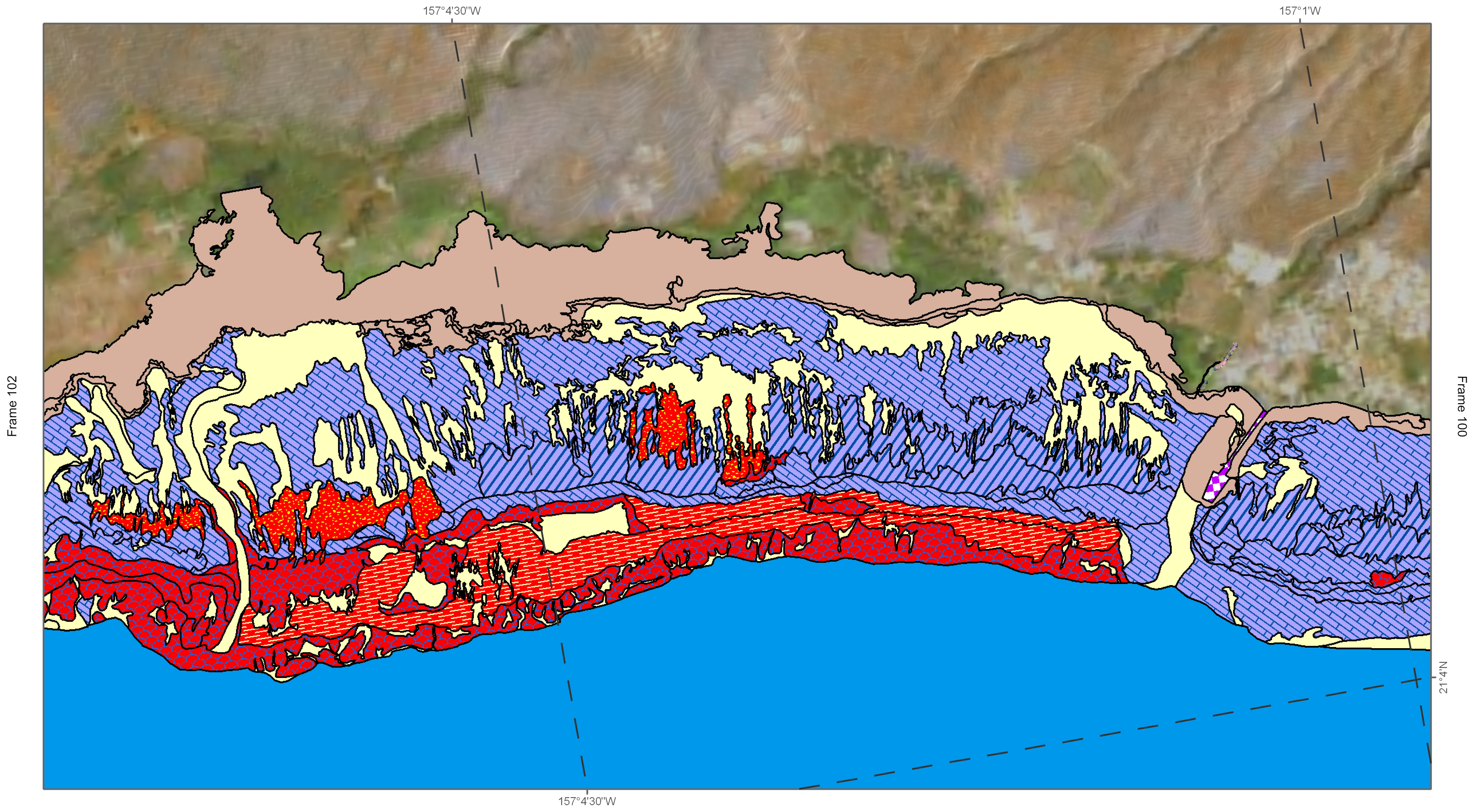
□ Minimum Mapping Unit (1 Acre)

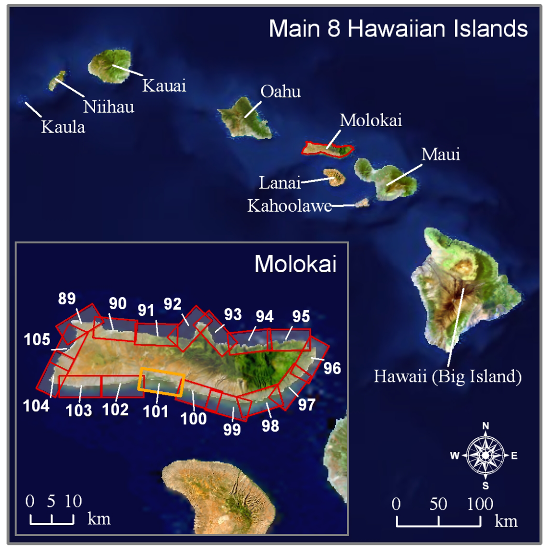
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 101)


157°4'30"W
157°1'W
Frame 102
Frame 100
21°4'N
157°4'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
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105
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104
103
102
101
100
99
98
97
0 5 10
km
N
W
E
S
0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

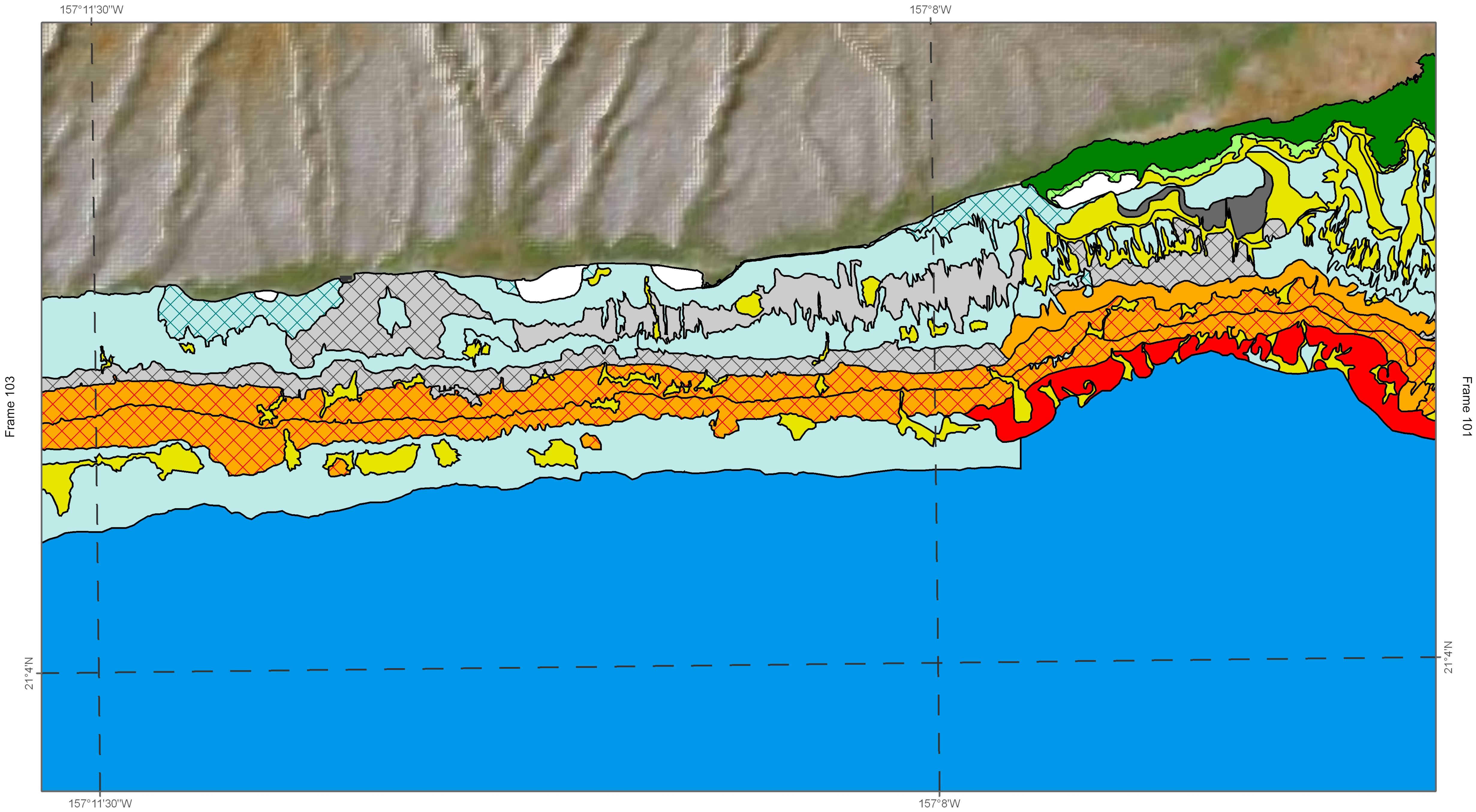
□ Minimum Mapping Unit (1 Acre)

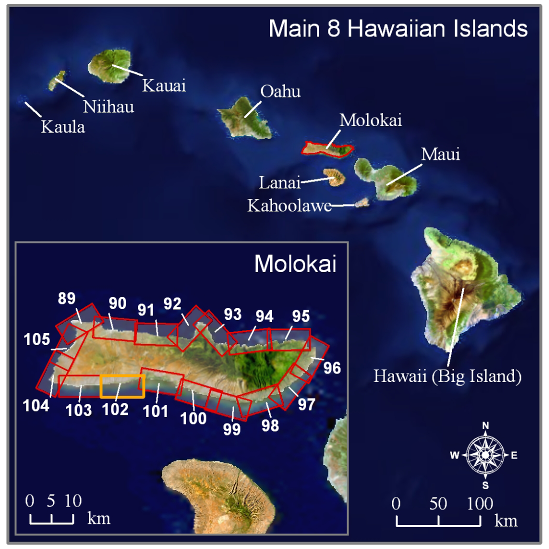
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 102)


157°11'30"W
157°8'W
Frame 103
Frame 101
21°4'N
21°4'N
157°11'30"W
157°8'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
90
91
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93
94
95
105
96
104
103
102
101
100
99
98
97
0 5 10
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

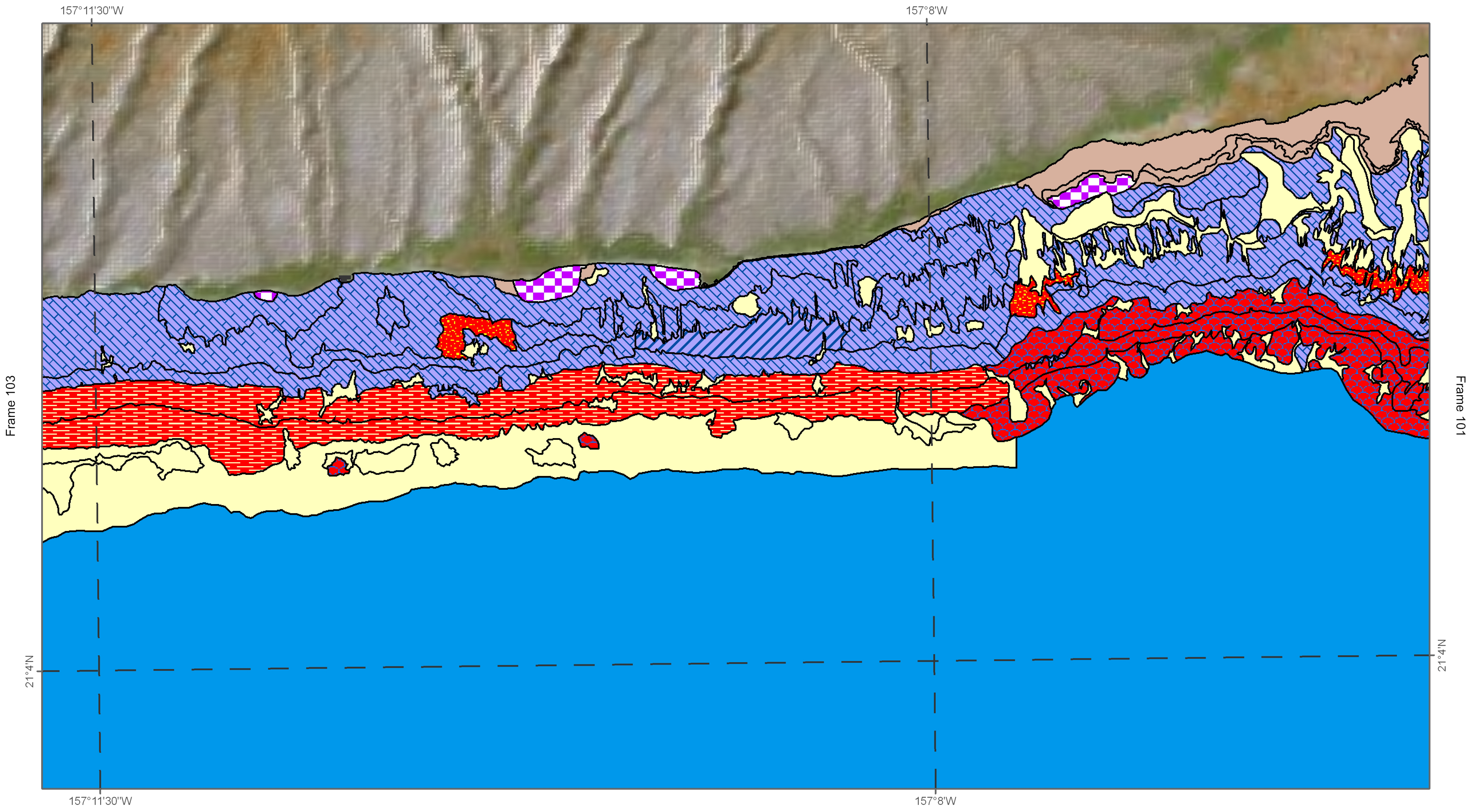
□ Minimum Mapping Unit (1 Acre)

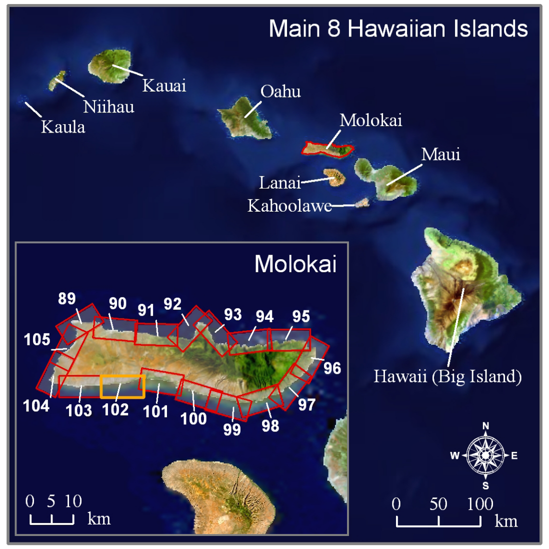
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 102)


157°11'30"W
157°8'W
Frame 103
Frame 101
21°4'N
21°4'N
157°11'30"W
157°8'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
90
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96
97
98
99
100
101
102
103
104
105
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

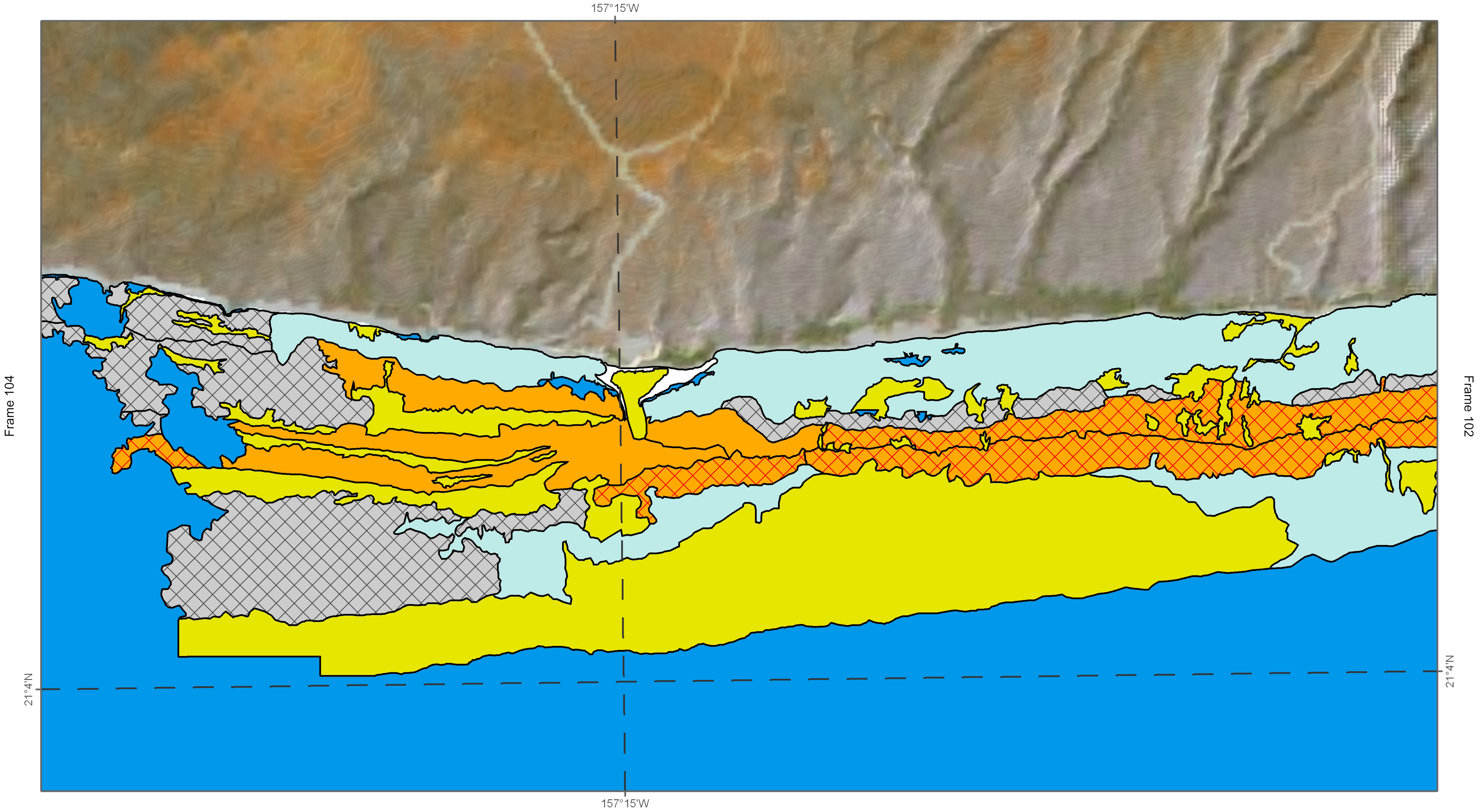
□ Minimum Mapping Unit (1 Acre)

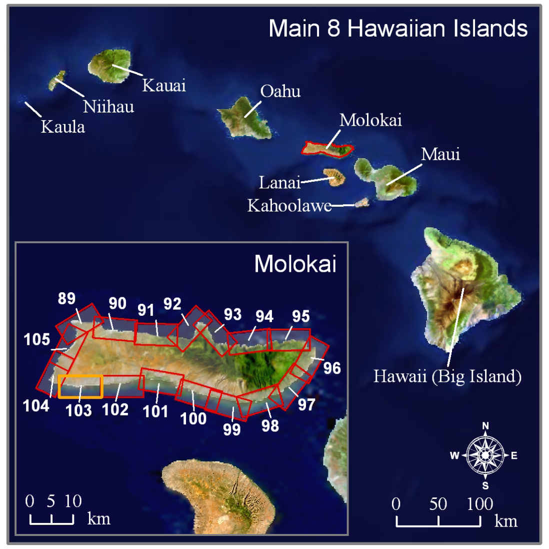
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 103)


157°15'W
Frame 104
Frame 102
21°4'N
21°4'N
157°15'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
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105
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104
103
102
101
100
99
98
0 5 10
km
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ⬛ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

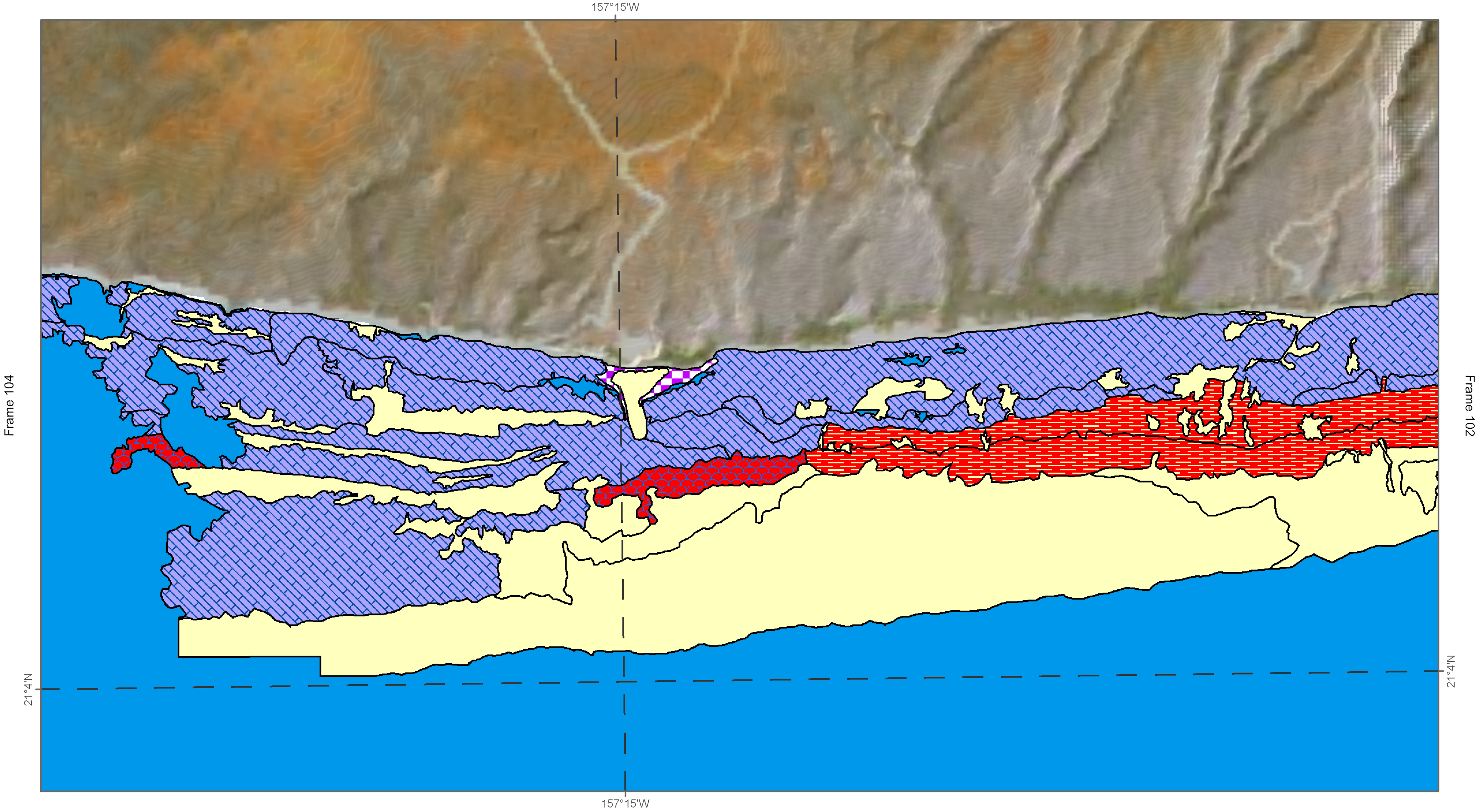
□ Minimum Mapping Unit (1 Acre)

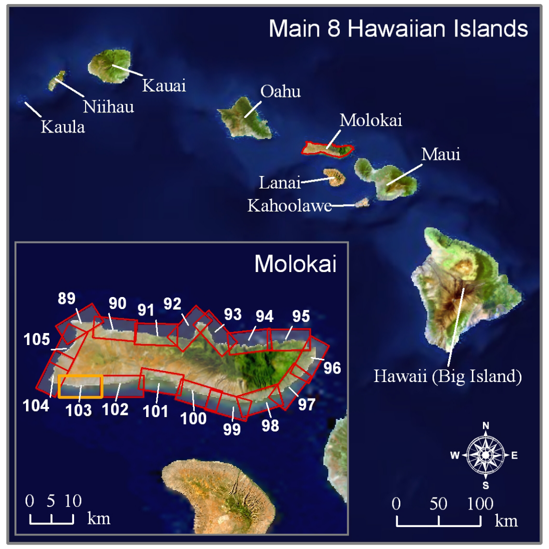
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 103)


157°15'W
Frame 104
Frame 102
21°4'N
21°4'N
157°15'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
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100
101
102
103
104
105
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

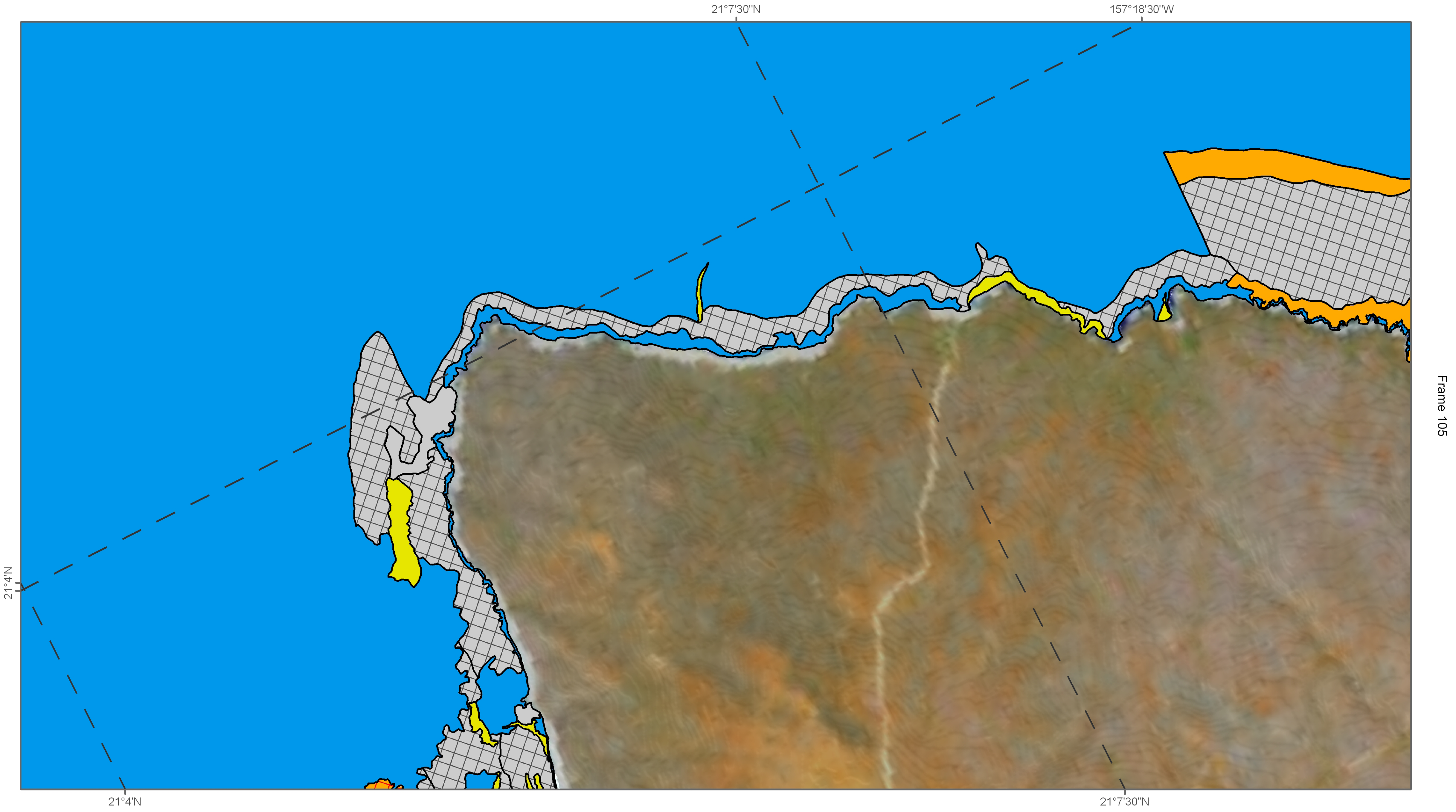
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

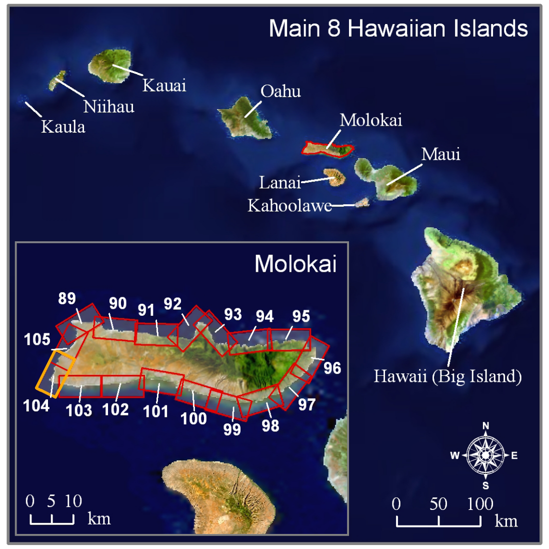
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 104)


21°7'30"N
157°18'30"W
21°4'N
21°4'N
21°7'30"N
Frame 105

0 0.5 1 1.5
km


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
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99
100
101
102
103
104
105
0 5 10
km
N
W
E
S
0 50 100
km

Biological Cover Types

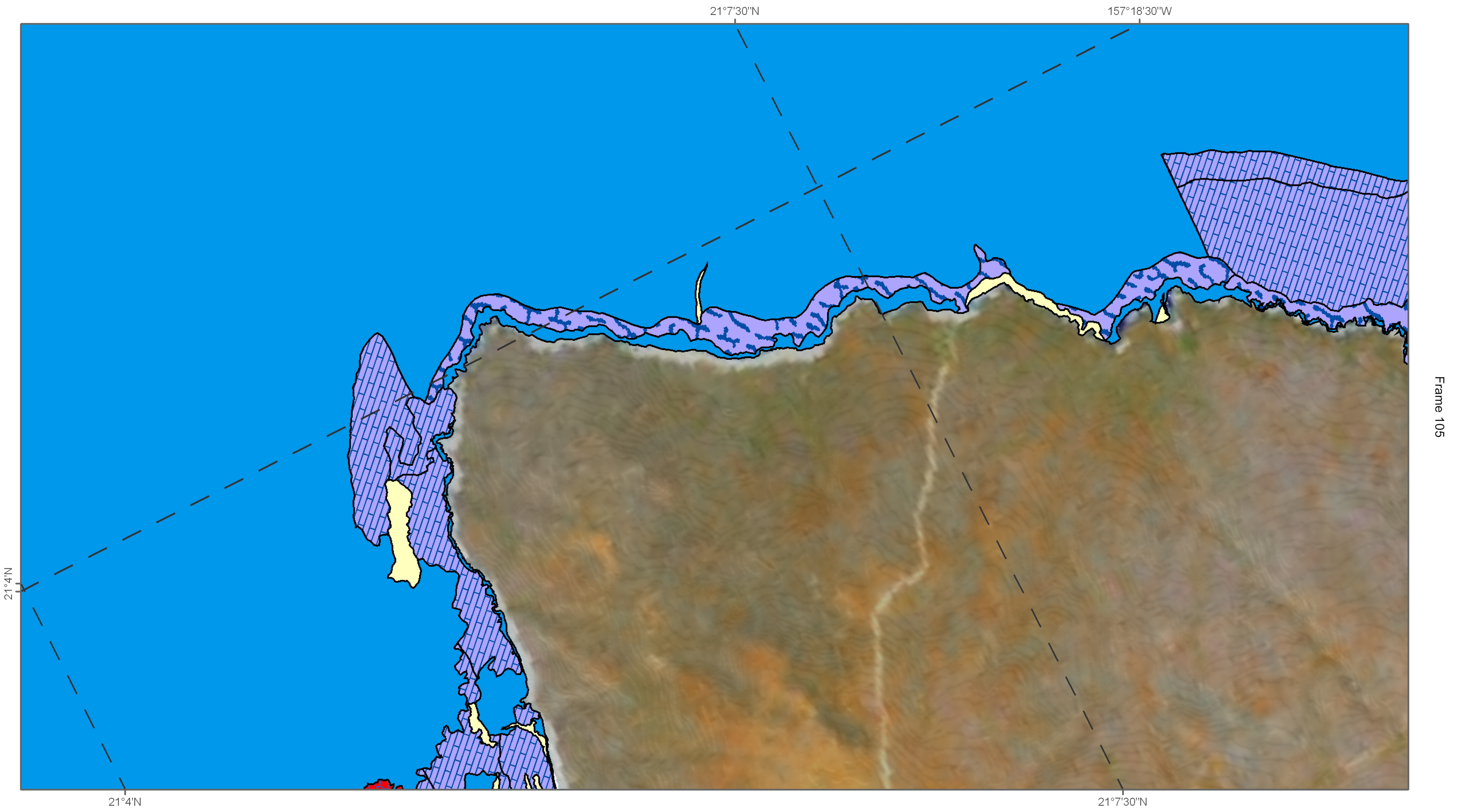
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

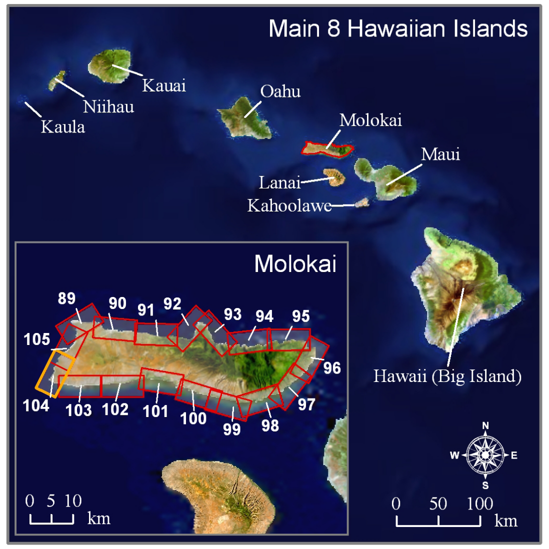
1 0.5 0
mi

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 104)


21°7'30"N
157°18'30"W
21°4'N
21°4'N
21°7'30"N
Frame 105

0
0.5
1
1.5
km

1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
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105
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104
103
102
101
100
99
98
97
0 5 10
km
0 50 100
km
N
W
E
S

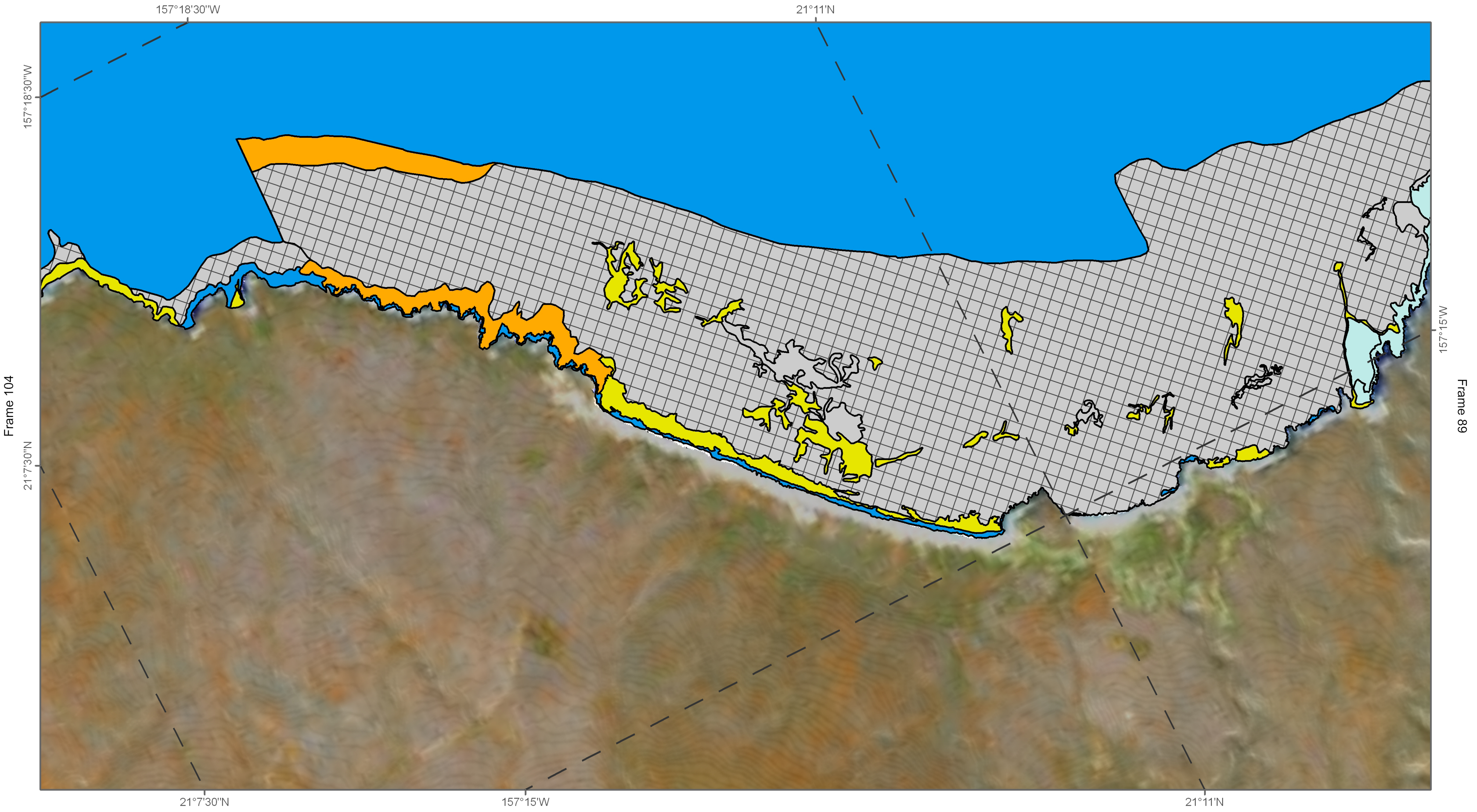
Geomorphological Structure Types

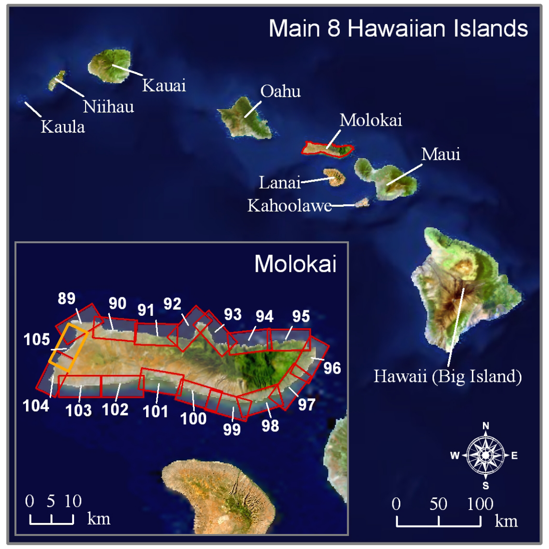
- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- 🟪 Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 105)


157°18'30"W
21°11'N
157°18'30"W
Frame 104
21°7'30"N
157°15'W
Frame 89
21°7'30"N
157°15'W
21°11'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
90
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99
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101
102
103
104
105
0 5 10
km
0 50 100
km
N
W
E
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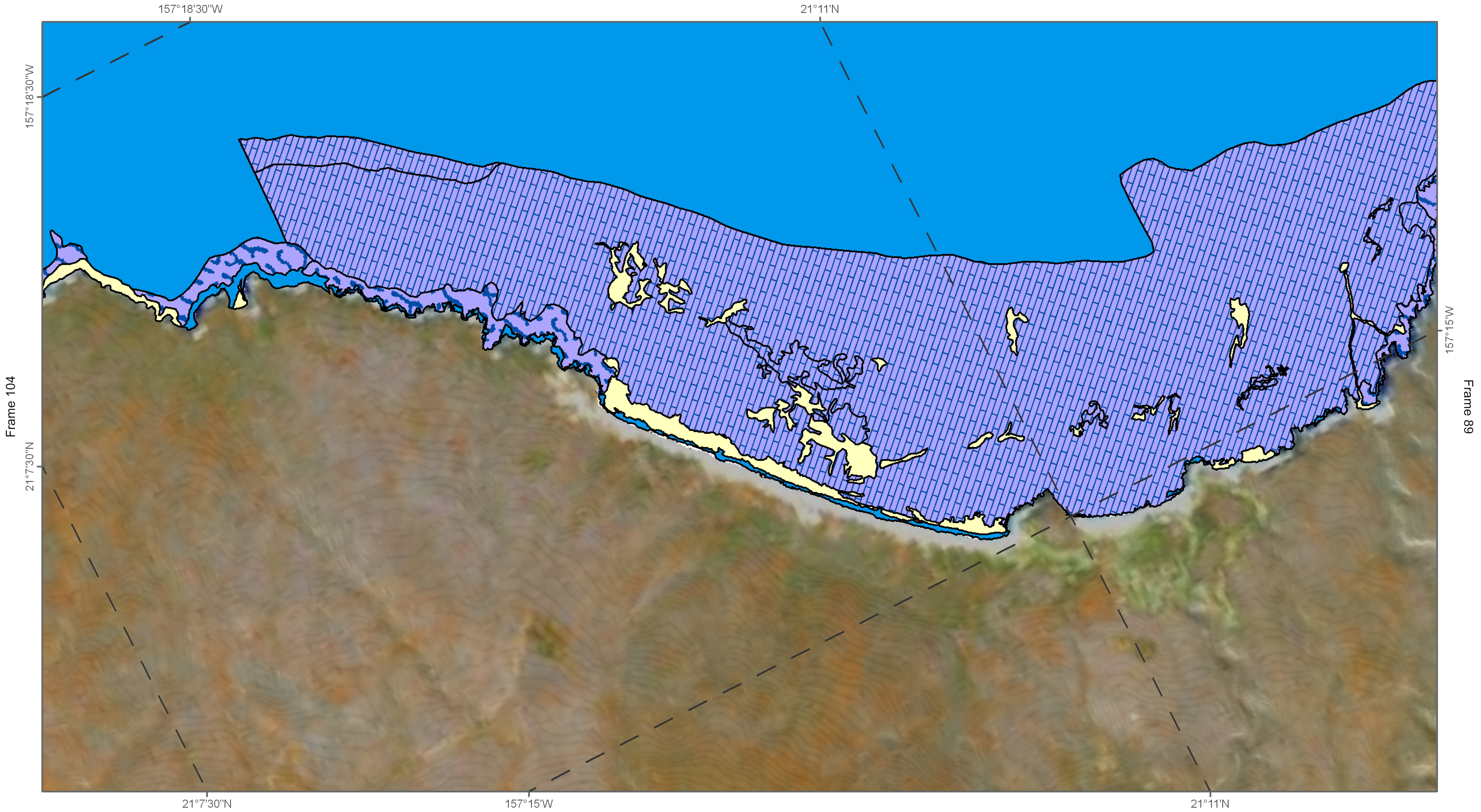
Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Molokai) : Shallow-water Benthic Habitats (Frame 105)


157°18'30"W
21°11'N
157°18'30"W
Frame 104
21°7'30"N
157°15'W
Frame 89
21°7'30"N
157°15'W
21°11'N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Molokai
89
90
91
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95
96
97
98
99
100
101
102
103
104
105
0 5 10
km
N
W
E
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0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▭ Mud
- ▭ Sand
- ■ Unknown

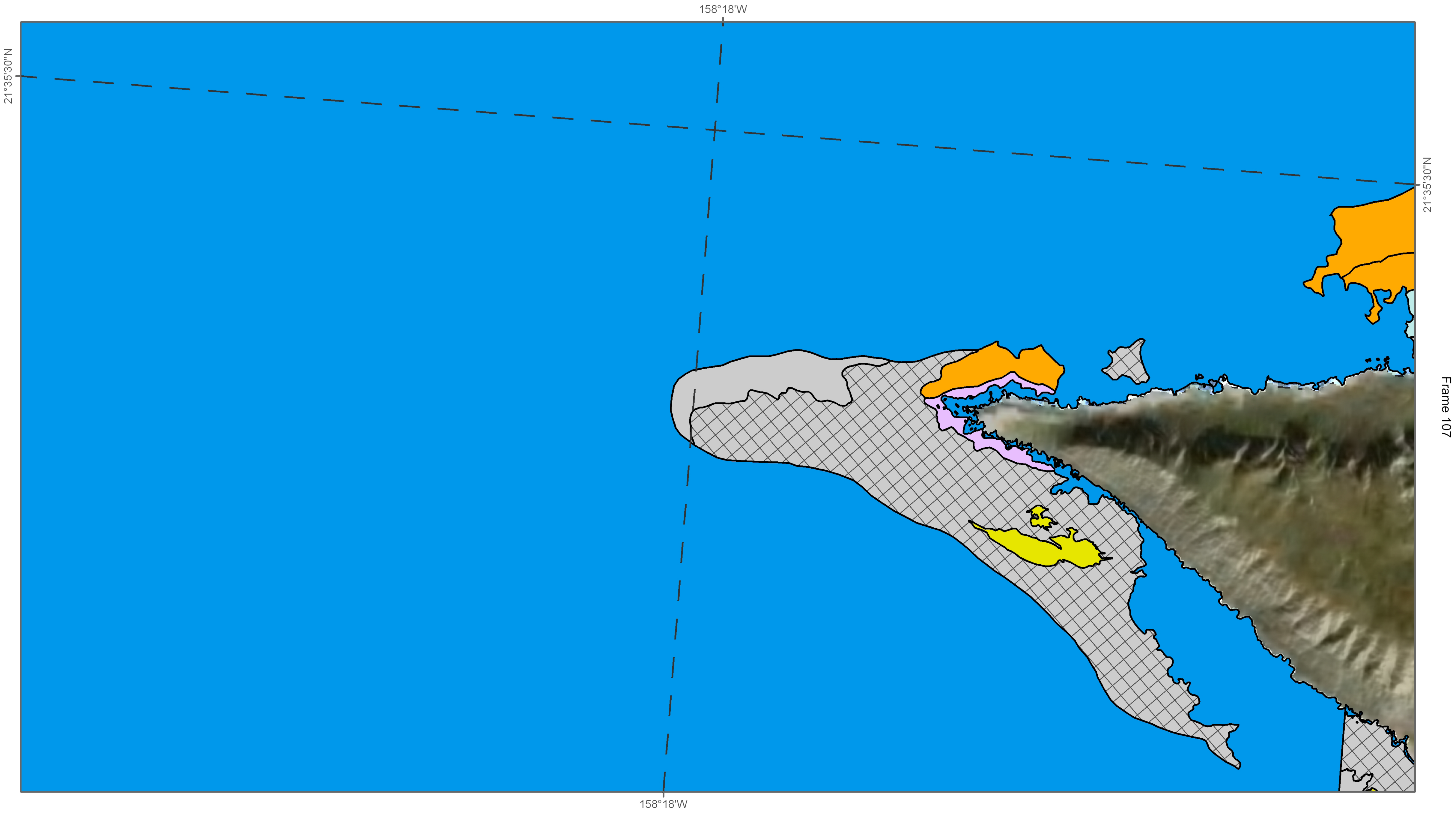
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 106)


158°18'W
21°35'30"N
21°35'30"N
Frame 107
158°18'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
106
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km
0 50 100
km
N
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▨ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ▨ Macroalgae 90%-100%
- ▨ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▨ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ▨ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ▨ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

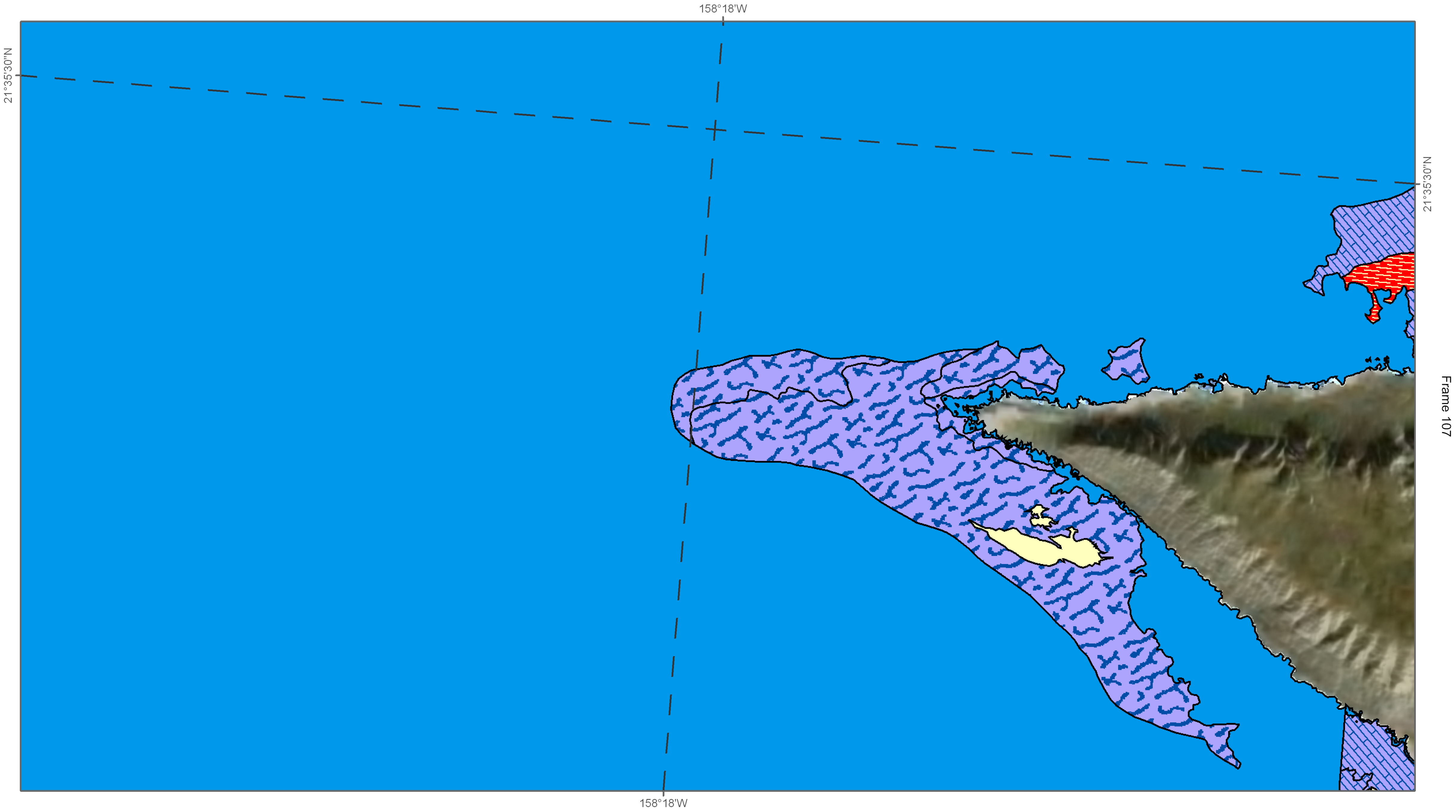
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

mi 1 0.5 0

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 106)


158°18'W
21°35'30"N
21°35'30"N
Frame 107
158°18'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100
km
Oahu
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0 5 10
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

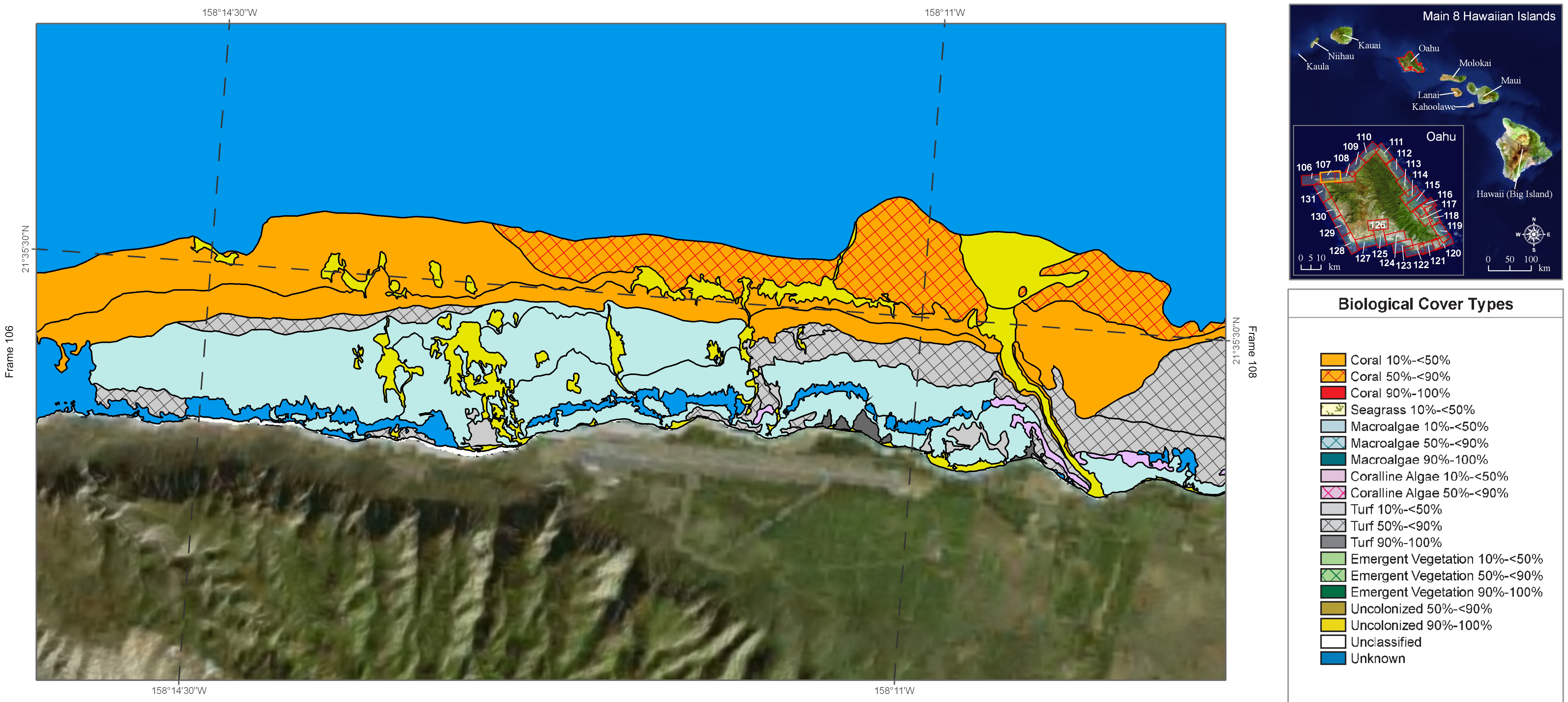
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 107)


158°14'30"W
158°11'W
21°35'30"N
Frame 106
Frame 108
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10 km
0 50 100 km
N
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Biological Cover Types

- ■ Coral 10%-<50%
- ▨ Coral 50%-<90%
- ■ Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- ■ Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- ■ Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- ■ Uncolonized 90%-100%
- □ Unclassified
- ■ Unknown

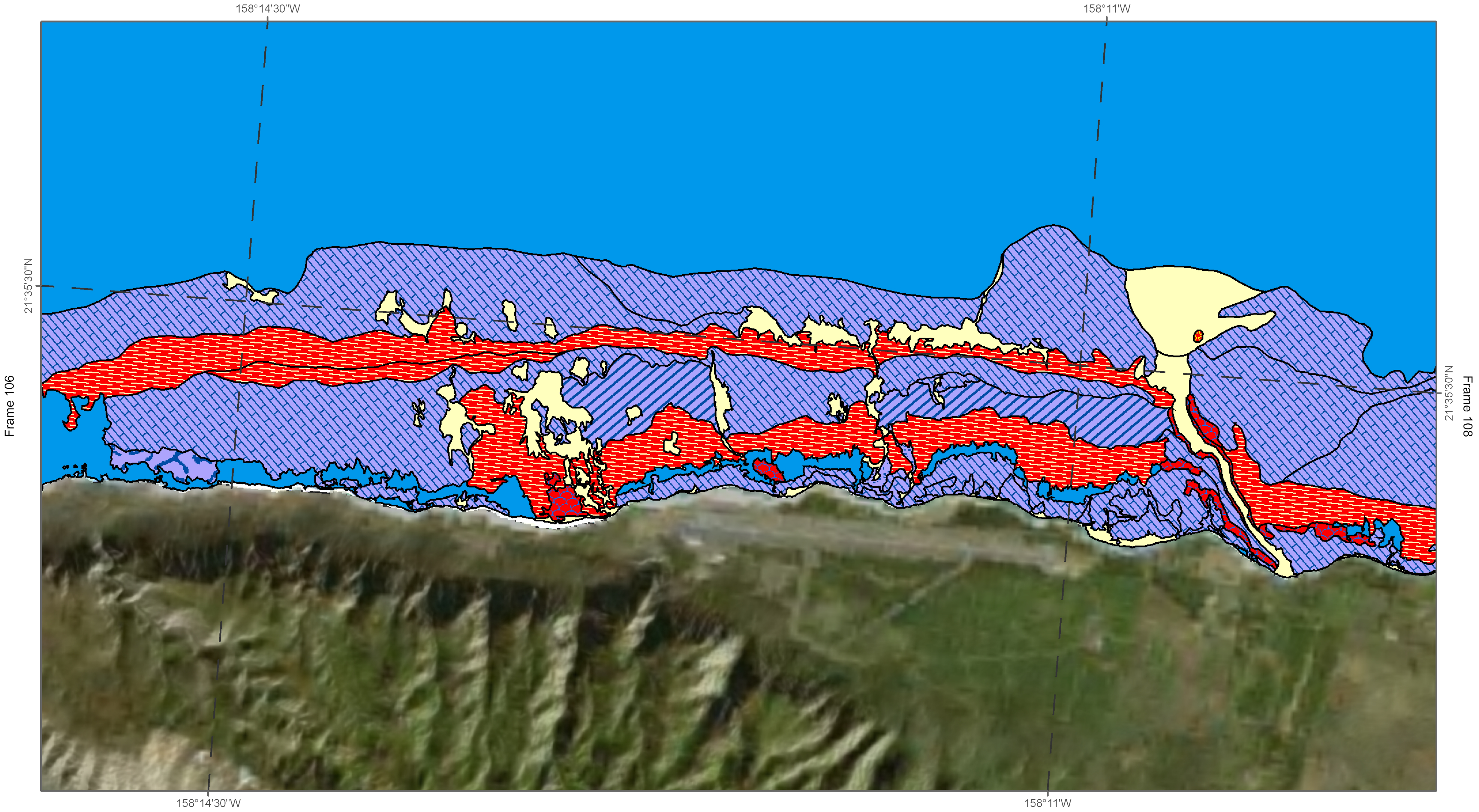
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

mi 1 0.5 0

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 107)


158°14'30"W
158°11'W
21°35'30"N
21°35'30"N
Frame 106
Frame 108
158°14'30"W
158°11'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
106
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130
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0 5 10 km
0 50 100 km

Geomorphological Structure Types

- Aggregate Reef
- Aggregated Patch Reef
- Individual Patch Reef
- Scattered Coral/Rock
- Spur and Groove
- Pavement
- Pavement with Sand Channels
- Rock/Boulder
- Rubble
- Artificial
- Mud
- Sand
- Unknown

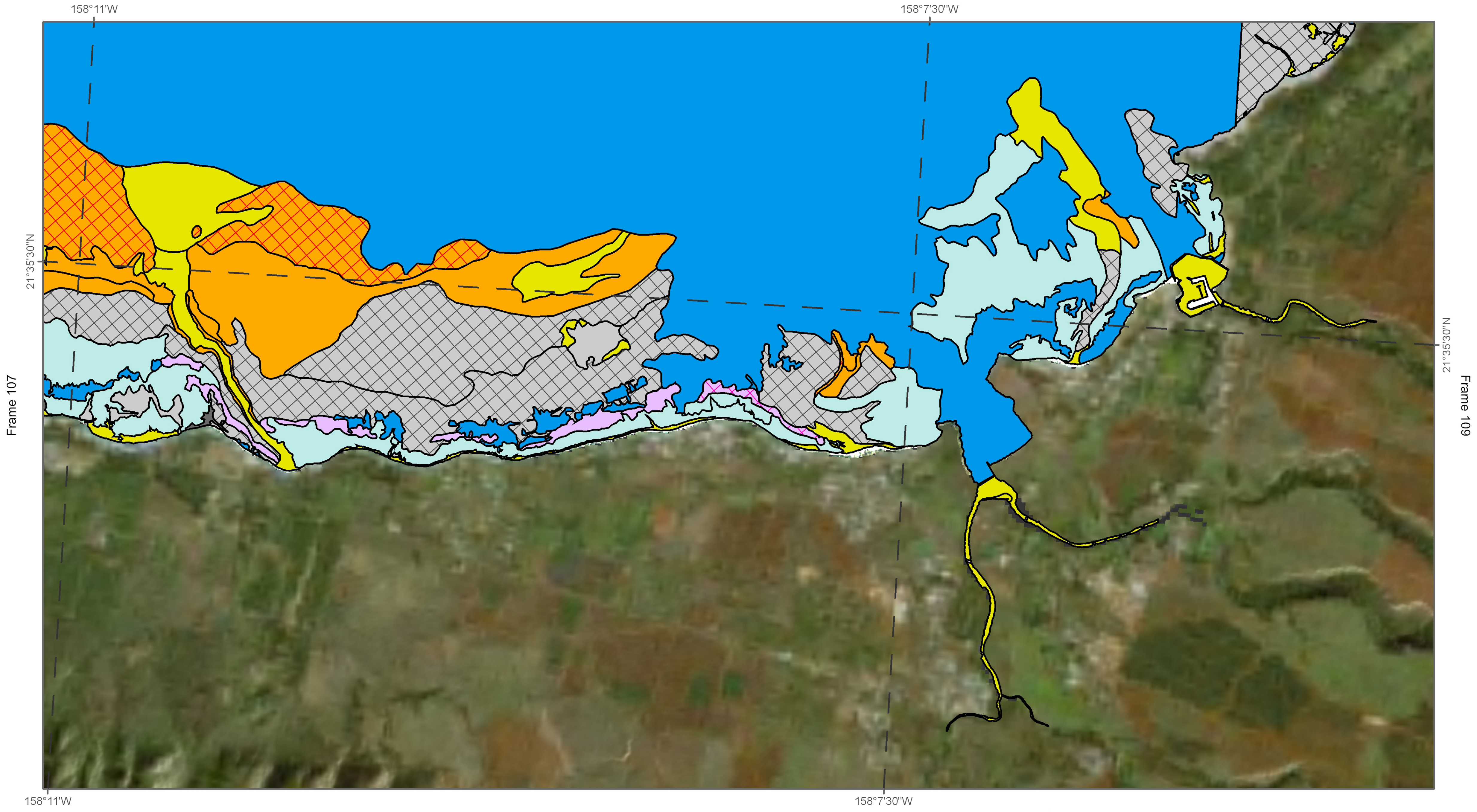
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 108)


158°11'W
158°7'30"W
21°35'30"N
21°35'30"N
Frame 107
Frame 109
158°11'W
158°7'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100
km
Oahu
110
111
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115
116
131
117
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0 5 10
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- 🟦 Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

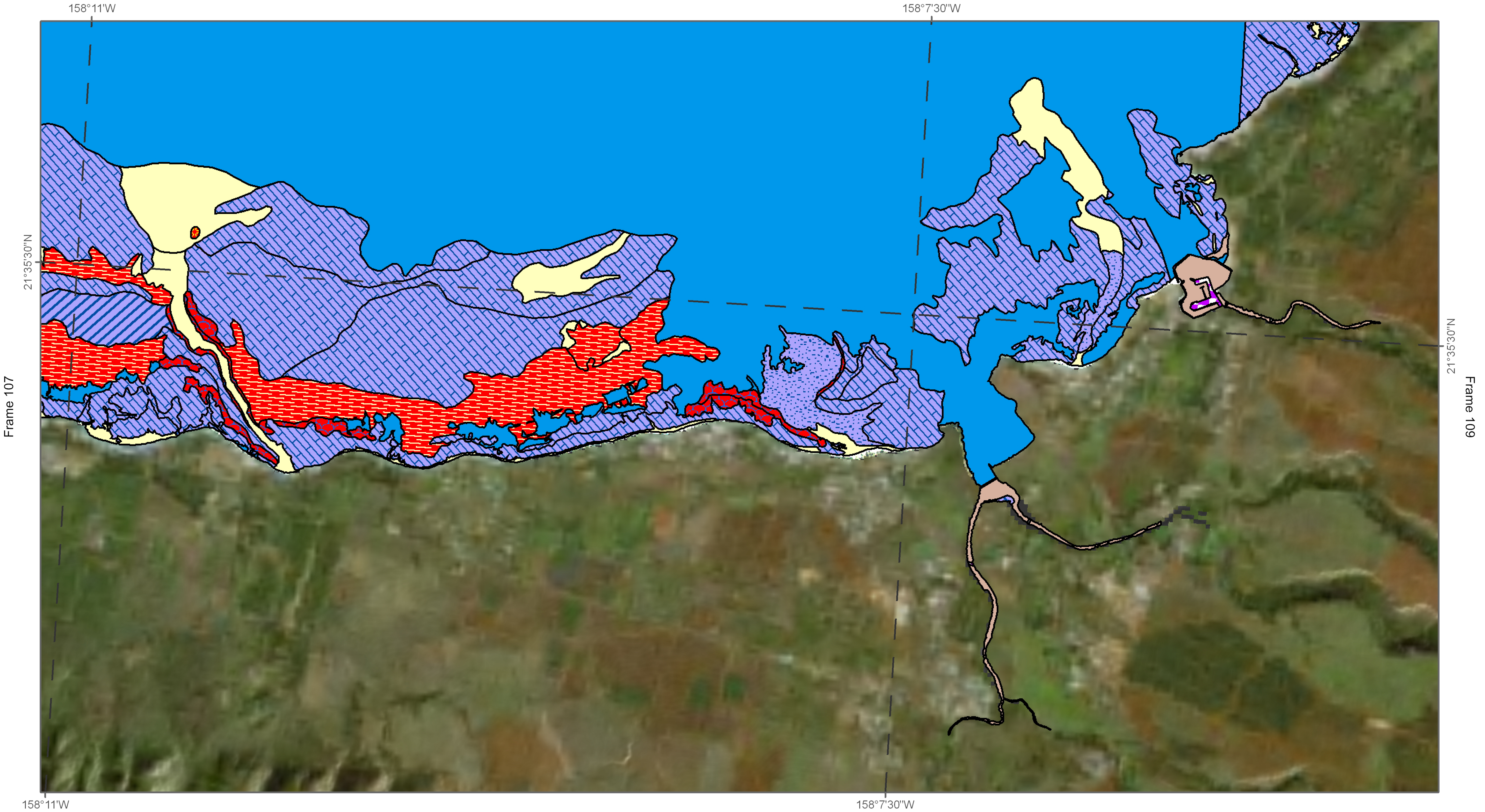
□ Minimum Mapping Unit (1 Acre)

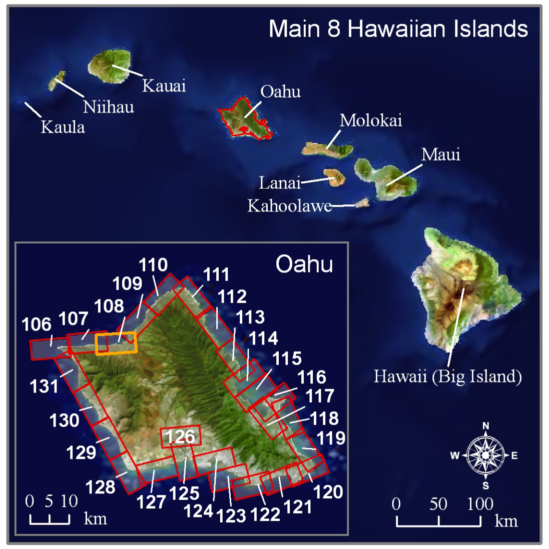
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 108)


158°11'W
158°7'30"W
21°35'30"N
21°35'30"N
Frame 107
Frame 109
158°11'W
158°7'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10
km
0 50 100
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Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

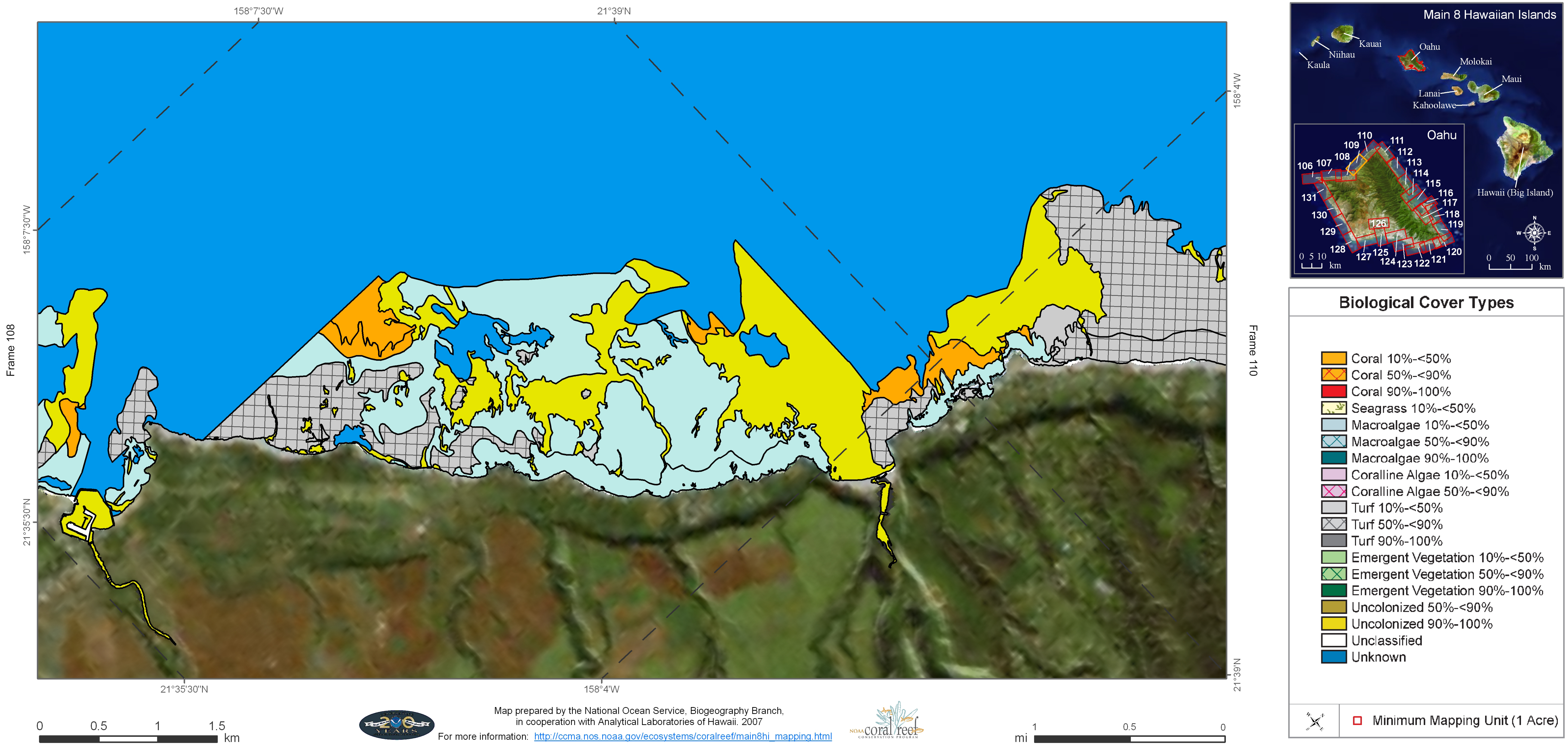
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 109)


158°7'30"W
21°39'N
158°4'W
158°7'30"W
Frame 108
Frame 110
21°35'30"N
21°35'30"N
158°4'W
21°39'N
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Oahu
106
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130
131
0 5 10 km
0 0.5 1 1.5 km
1 0.5 0 mi

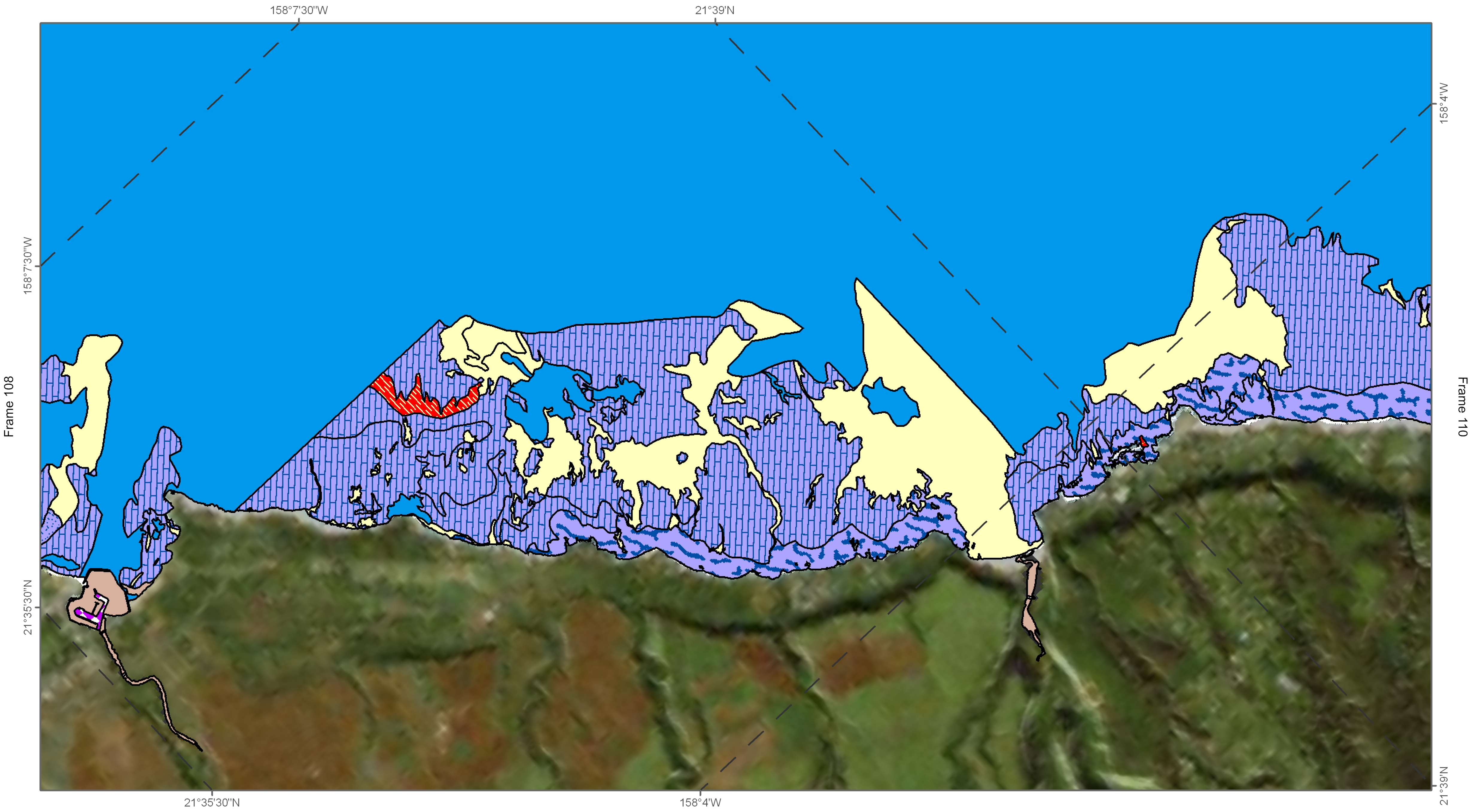
Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 109)


158°7'30"W
21°39'N
158°4'W
158°7'30"W
21°35'30"N
Frame 108
Frame 110
21°35'30"N
158°4'W
21°39'N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10
km
0 50 100
km
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E
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Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ■ Mud
- ■ Sand
- ■ Unknown

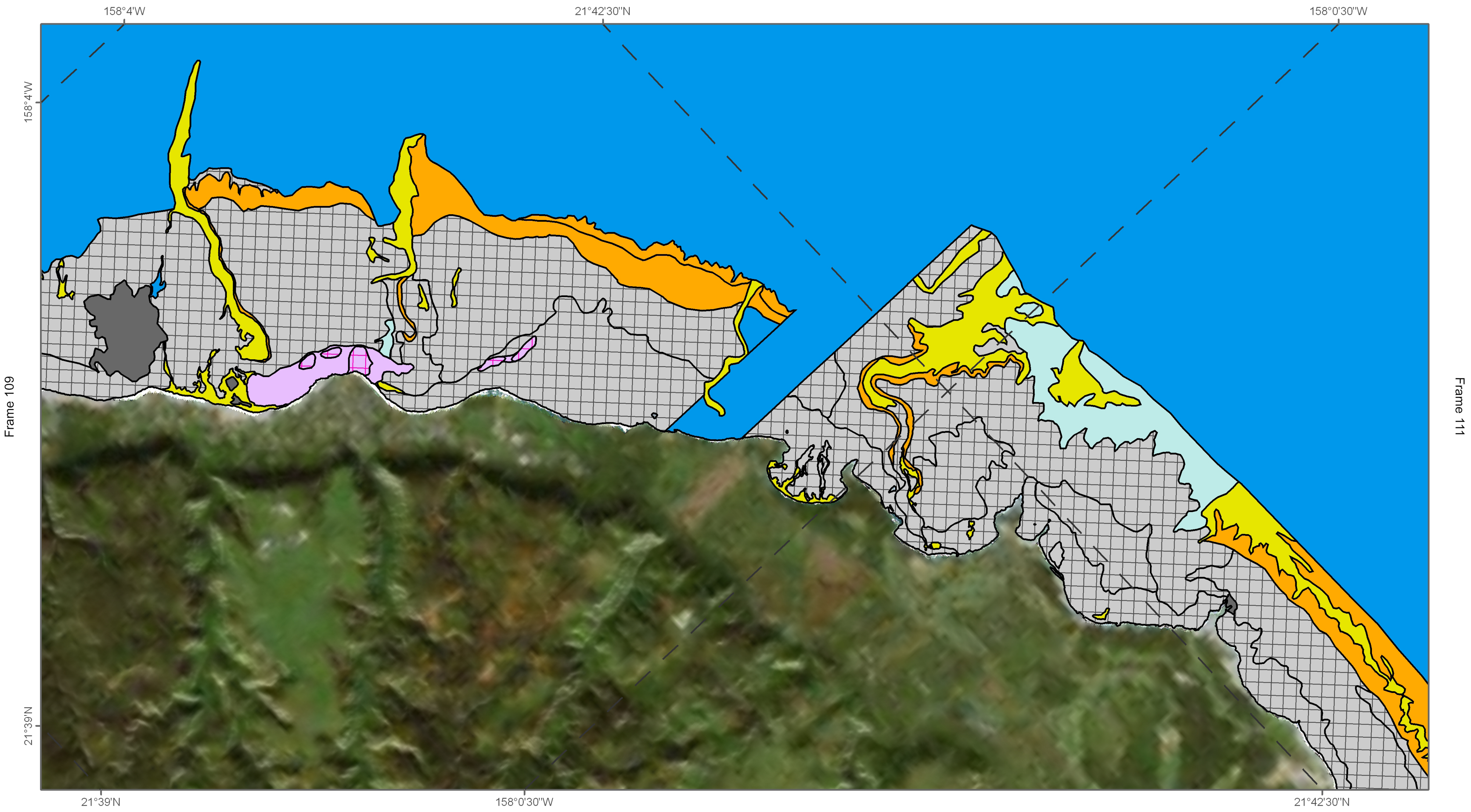
□ Minimum Mapping Unit (1 Acre)

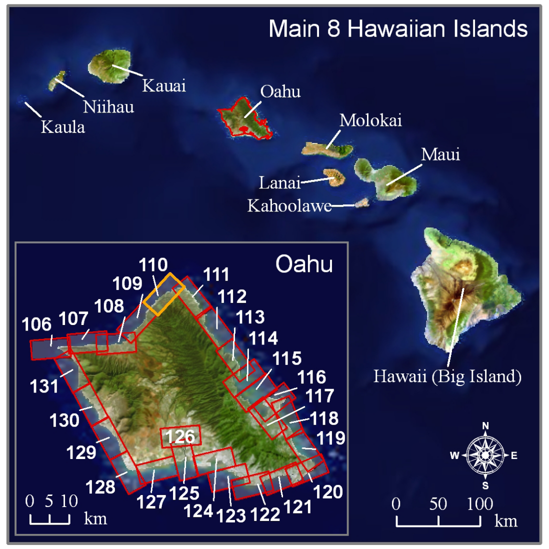
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 110)


158°4'W
21°42'30"N
158°0'30"W
158°4'W
Frame 109
21°39'N
Frame 111
21°39'N
158°0'30"W
21°42'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Oahu
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121
0 5 10 km

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

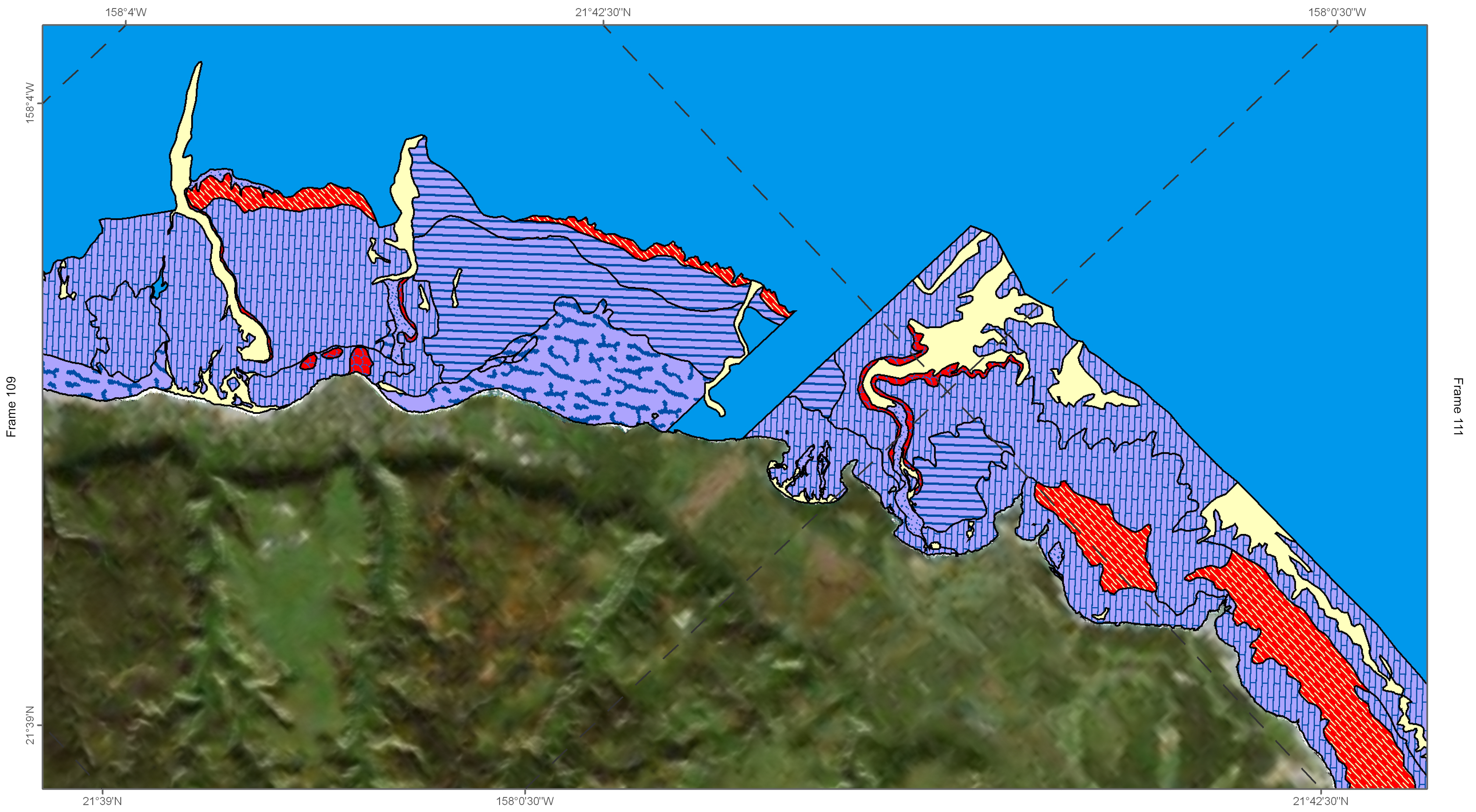
mi 1 0.5 0

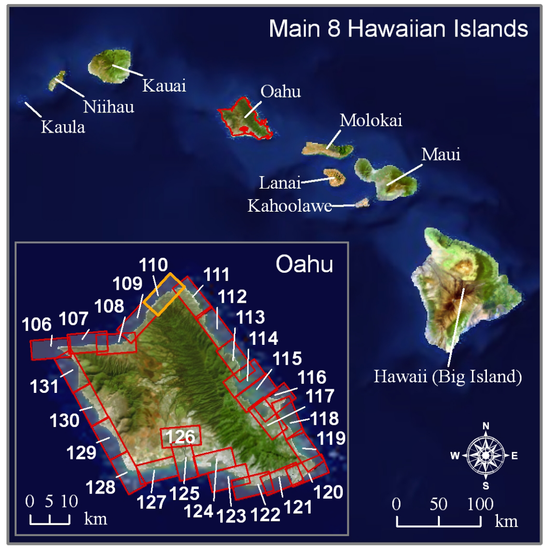
Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ⬛ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 110)


158°4'W
21°42'30"N
158°0'30"W
158°4'W
Frame 109
21°39'N
Frame 111
21°39'N
158°0'30"W
21°42'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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130
131
0 5 10
km
0 50 100
km
N
W
E
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Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

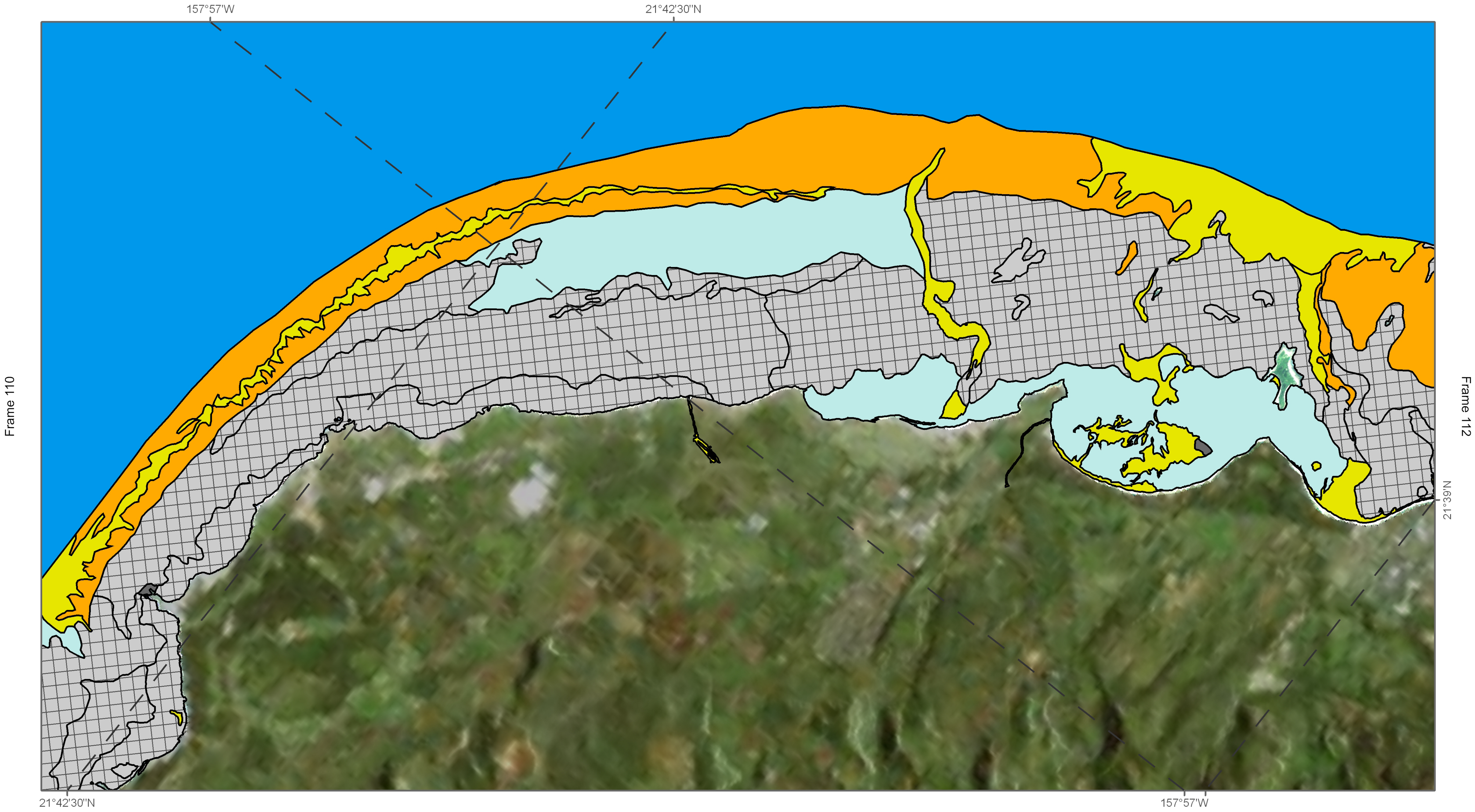
☐ Minimum Mapping Unit (1 Acre)

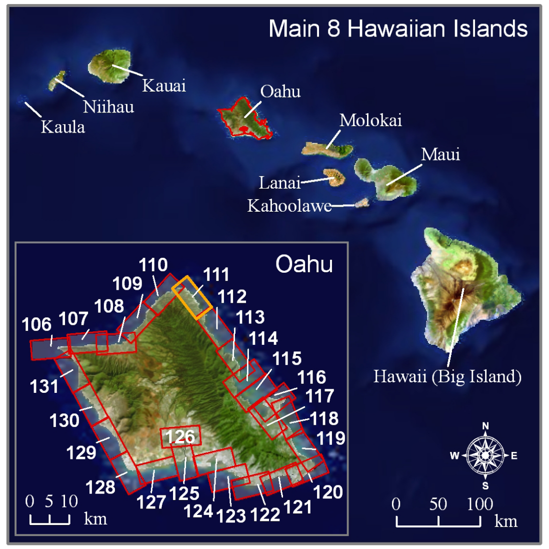
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 111)


157°57'W
21°42'30"N
Frame 110
Frame 112
21°39'N
21°42'30"N
157°57'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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128
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130
131
0 5 10
km
0 50 100
km
N
S
E
W

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▢ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▢ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▢ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- ■ Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

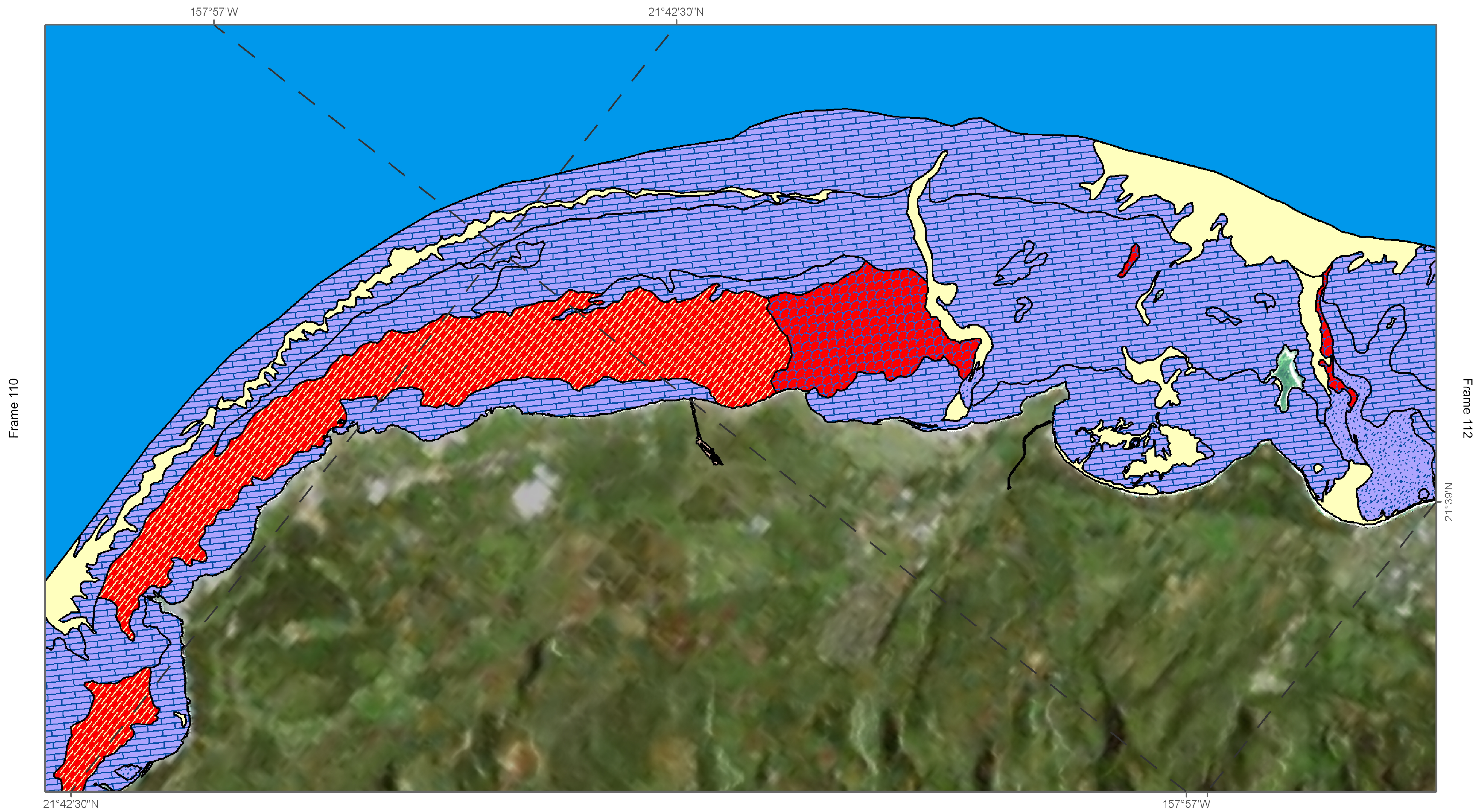
□ Minimum Mapping Unit (1 Acre)

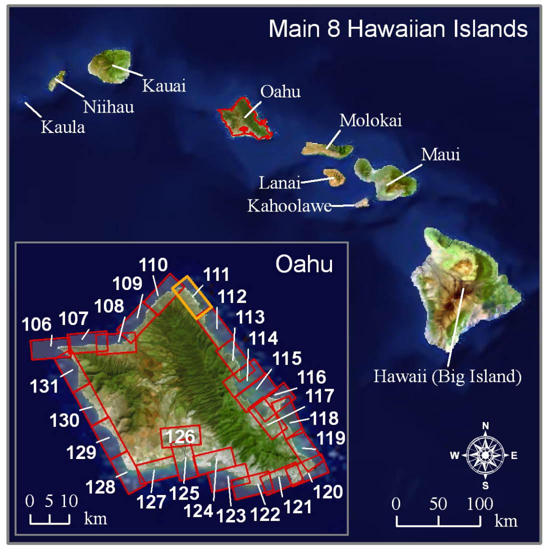
0 0.5 1 1.5
km

1 0.5 0
mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 111)


157°57'W
21°42'30"N
Frame 110
Frame 112
21°39'N
21°42'30"N
157°57'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
110
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121
120
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

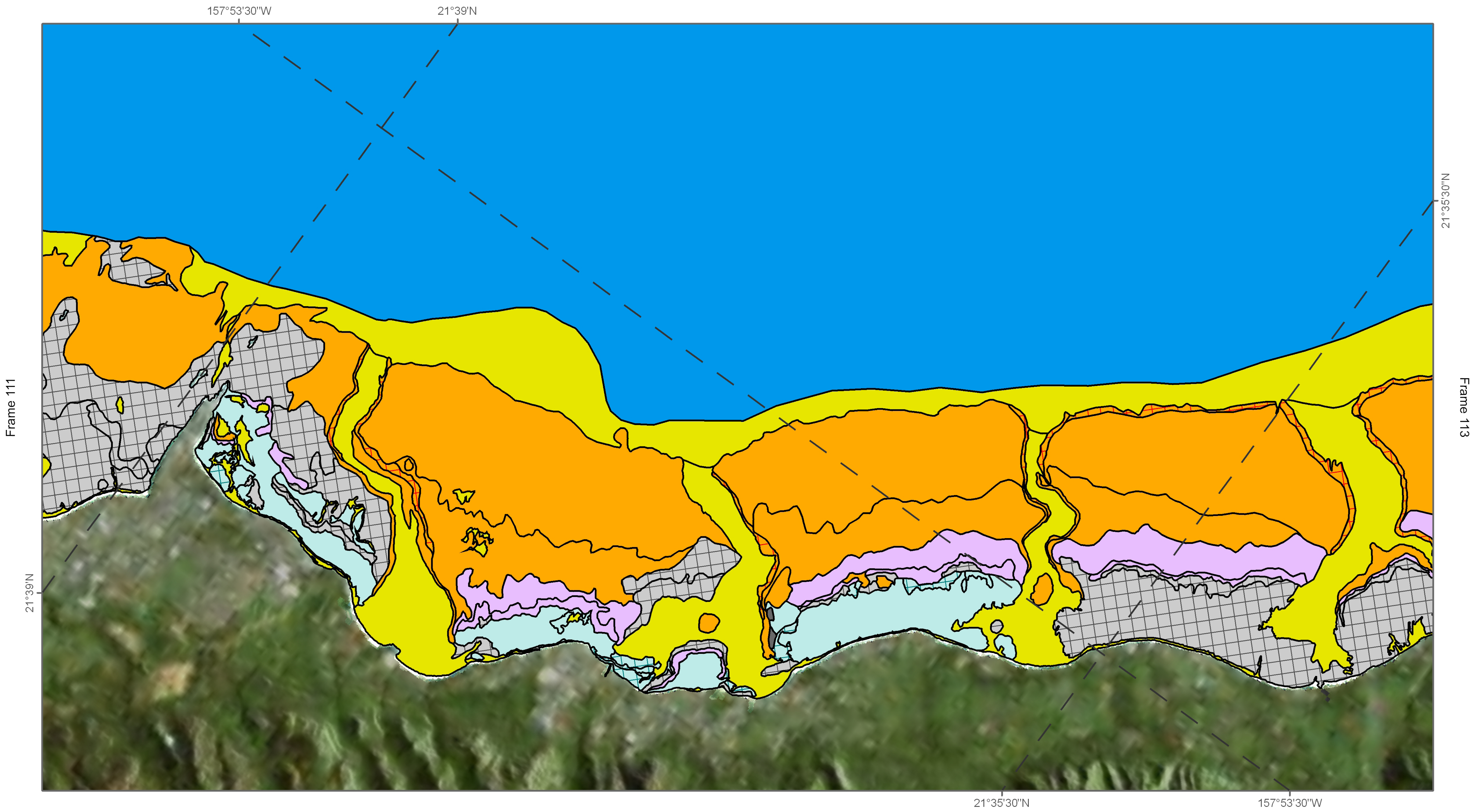
□ Minimum Mapping Unit (1 Acre)

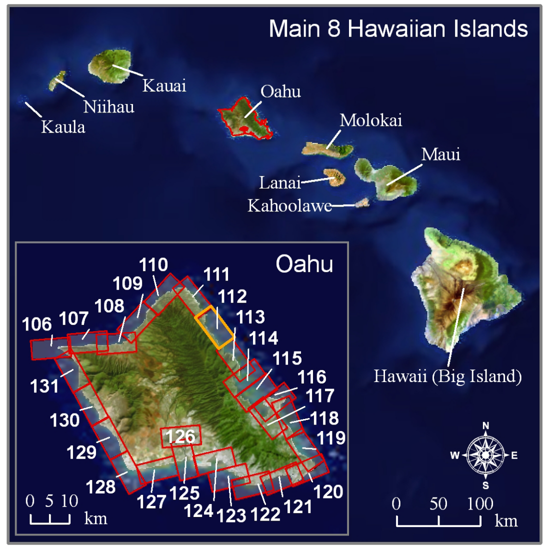
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 112)


157°53'30"W
21°39'N
21°35'30"N
Frame 111
Frame 113
21°39'N
21°35'30"N
157°53'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100
km
Oahu
110
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124
123
122
121
0 5 10
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▢ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▢ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▢ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

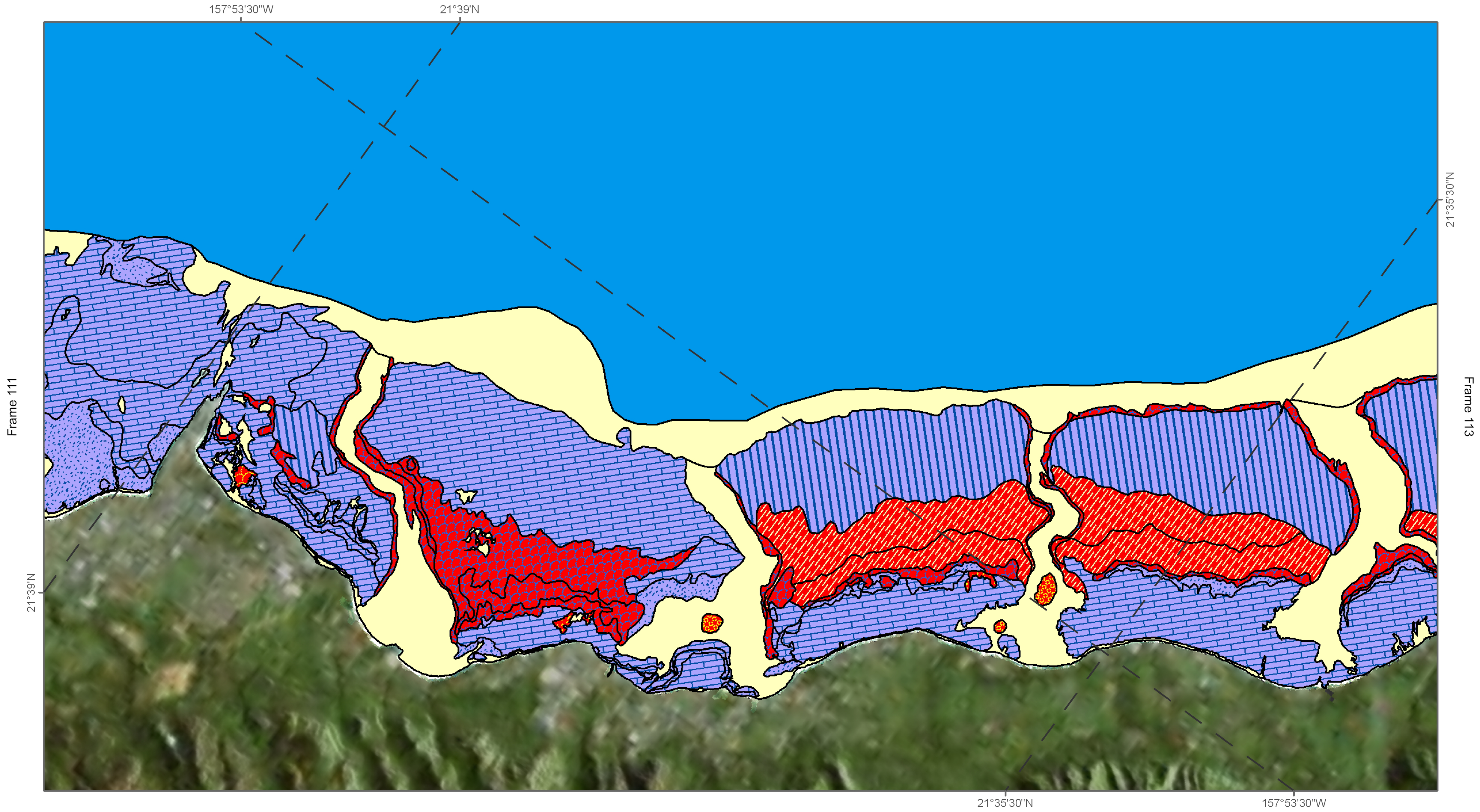
□ Minimum Mapping Unit (1 Acre)

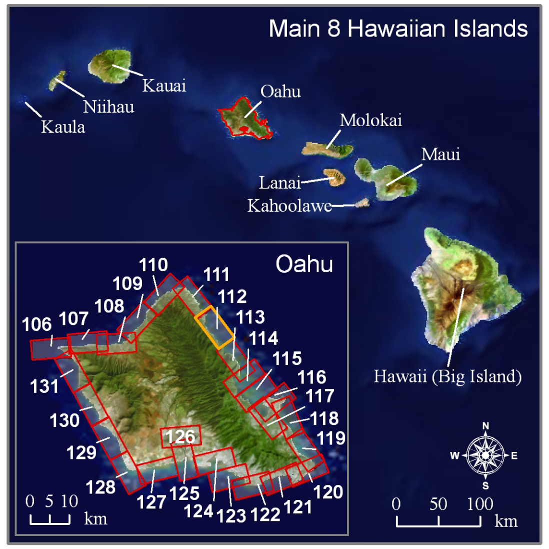
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 112)


157°53'30"W
21°39'N
21°35'30"N
Frame 111
Frame 113
21°39'N
21°35'30"N
157°53'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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km
0 50 100
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Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

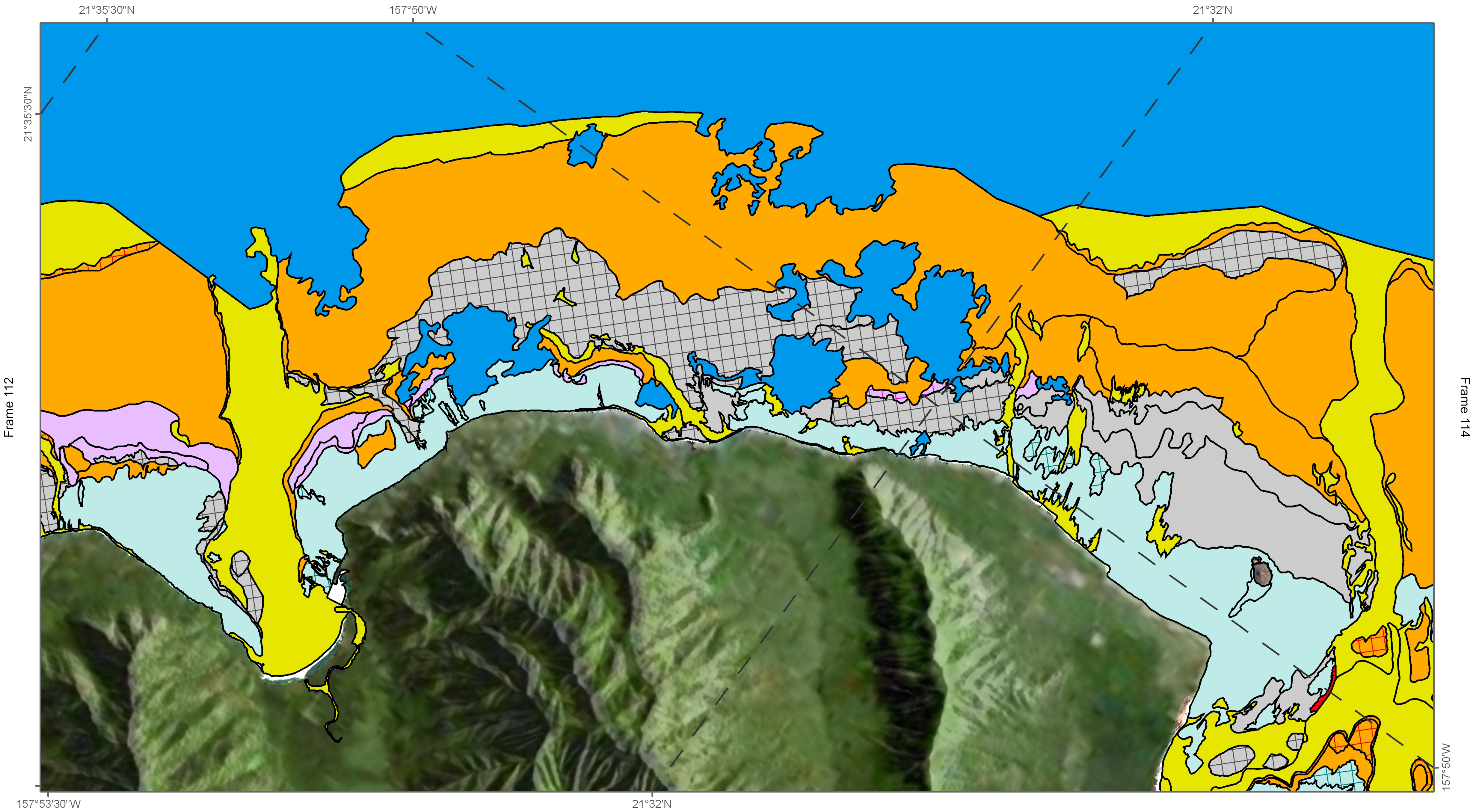
☐ Minimum Mapping Unit (1 Acre)

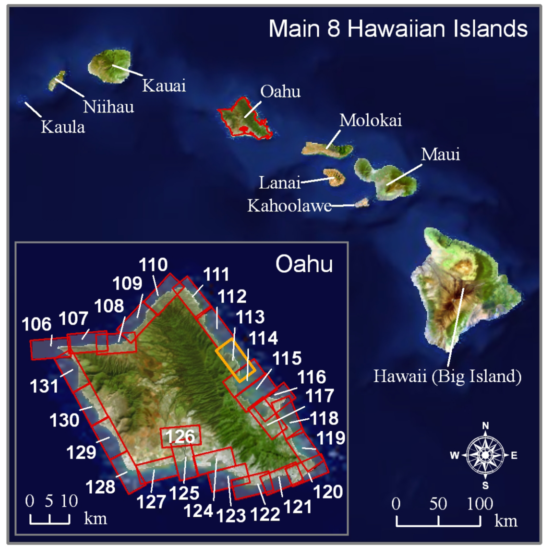
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 113)


21°35'30"N
157°50'W
21°32'N
21°35'30"N
Frame 112
Frame 114
157°53'30"W
21°32'N
157°50'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10
km
0 50 100
km
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

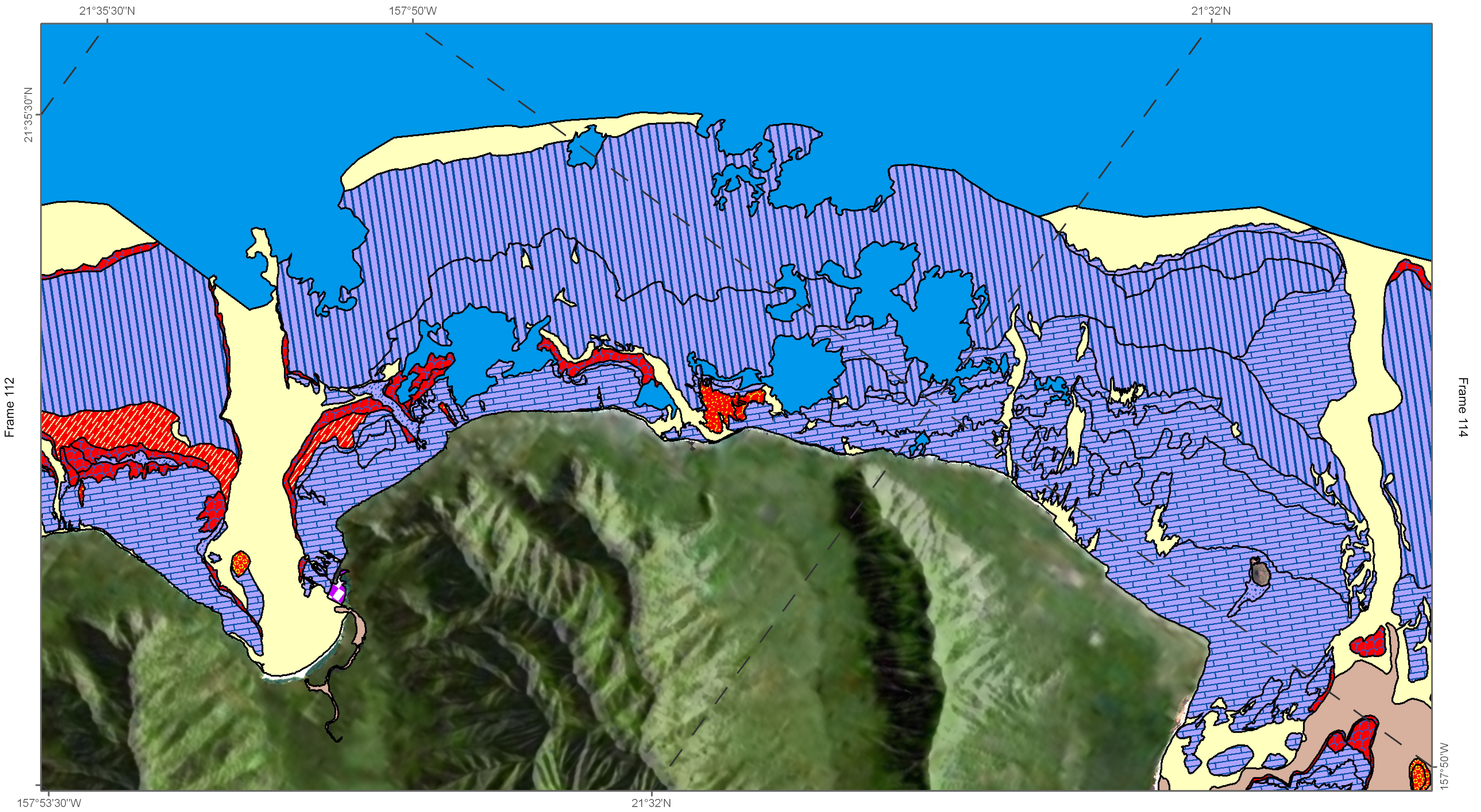
□ Minimum Mapping Unit (1 Acre)

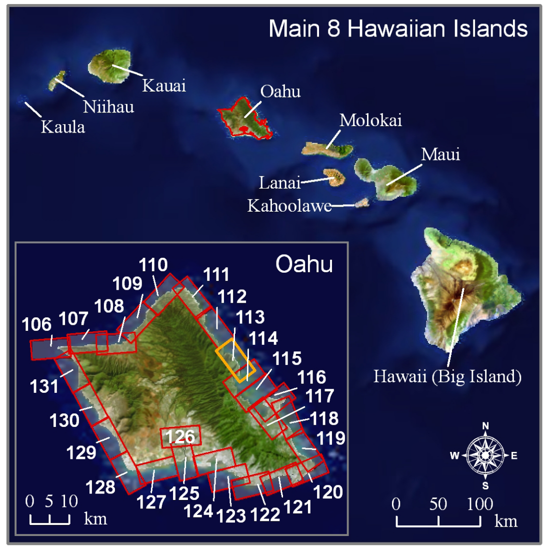
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 113)


21°35'30"N
157°50'W
21°32'N
21°35'30"N
Frame 112
Frame 114
157°53'30"W
21°32'N
157°50'W
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10 km
0 50 100 km
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Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
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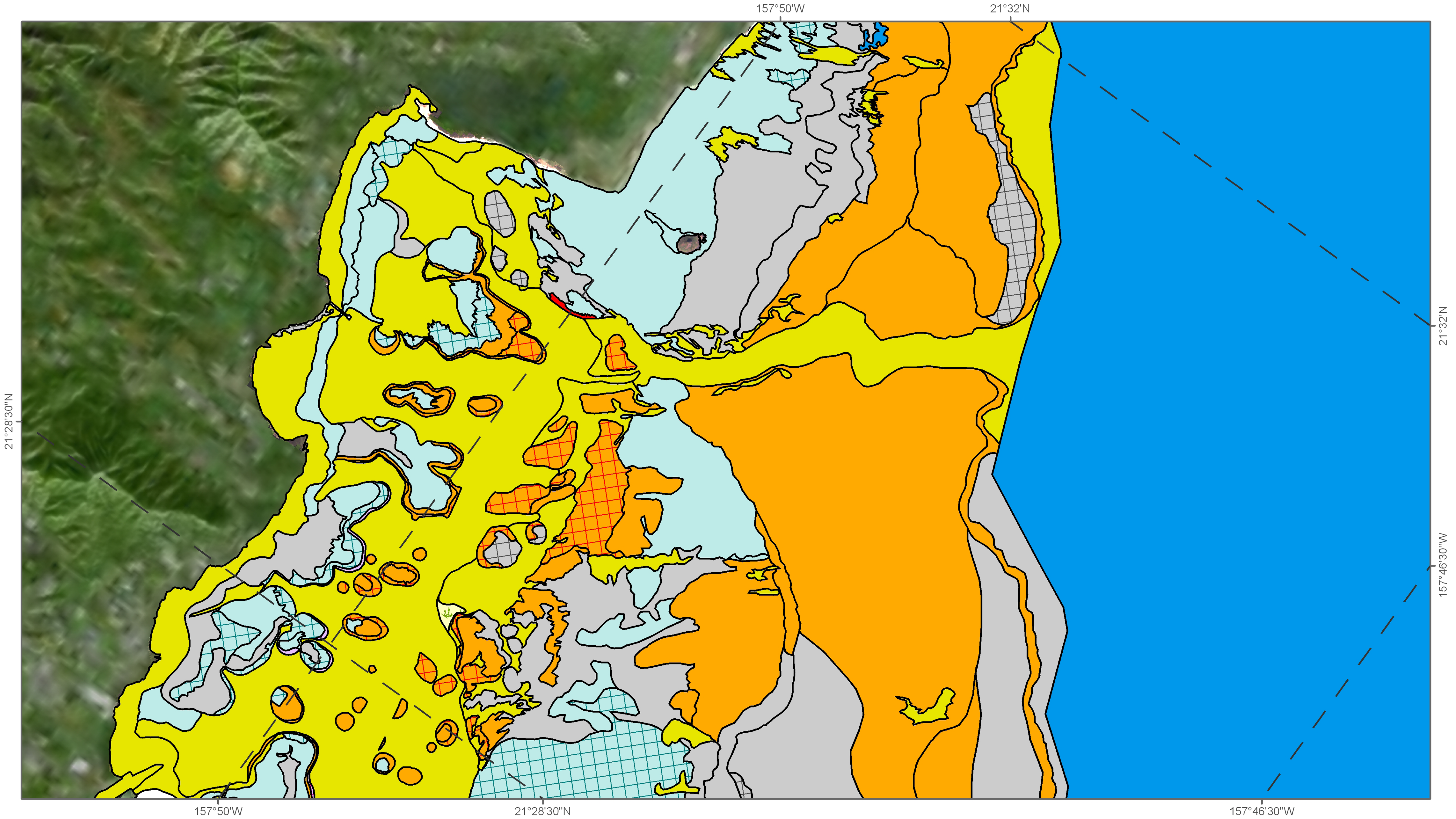
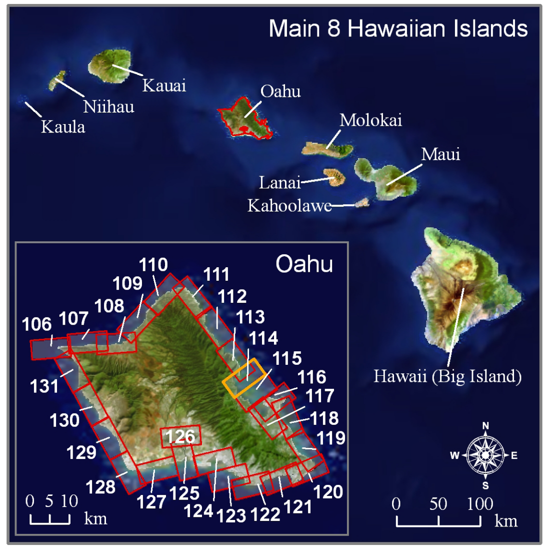
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 114)


157°50'W
21°32'N
21°28'30"N
21°32'N
157°46'30"W
157°50'W
21°28'30"N
157°46'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

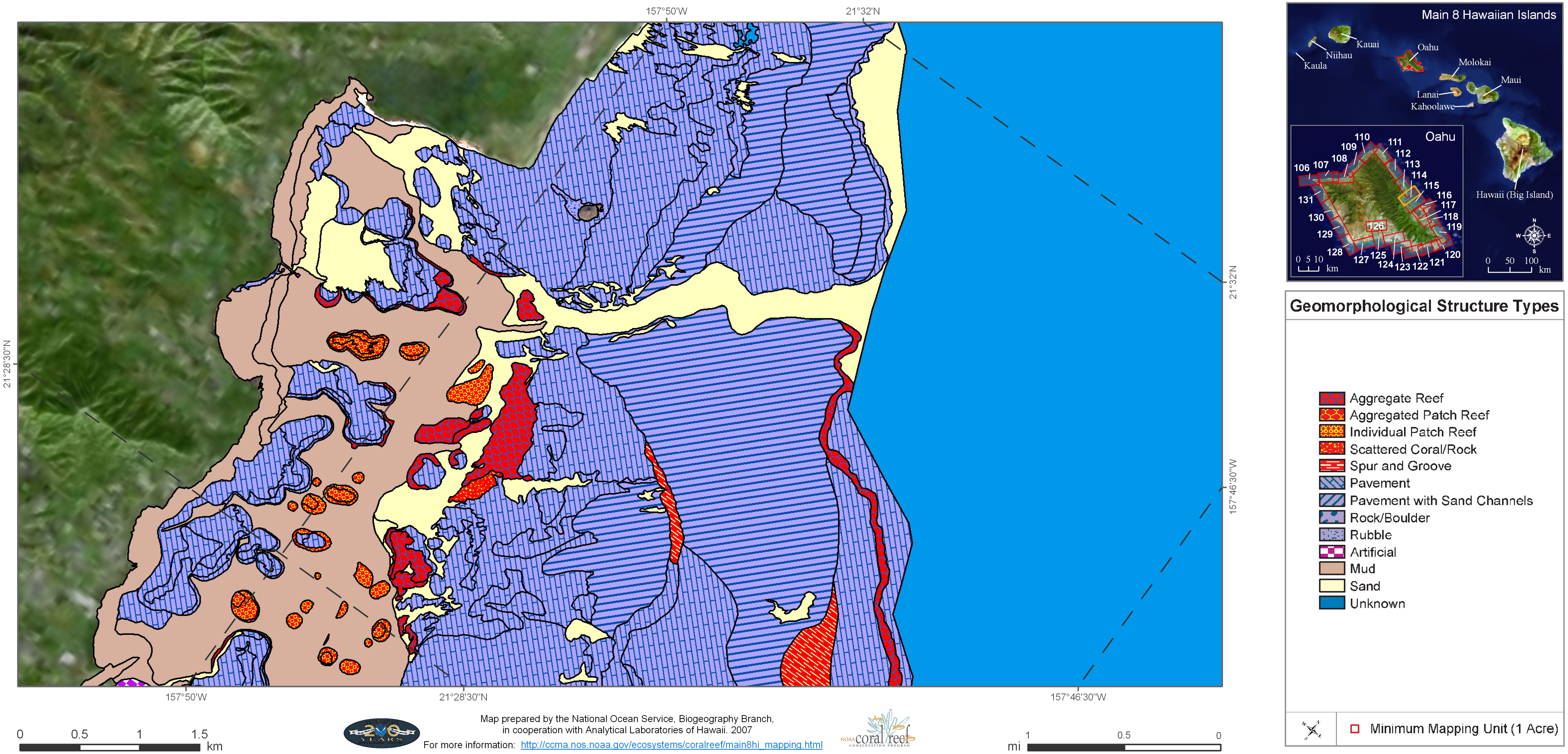
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 114)


157°50'W
21°32'N
21°32'N
21°28'30"N
157°46'30"W
157°50'W
21°28'30"N
157°46'30"W
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Main 8 Hawaiian Islands
Kauai
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Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
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0 5 10
km
0 50 100
km
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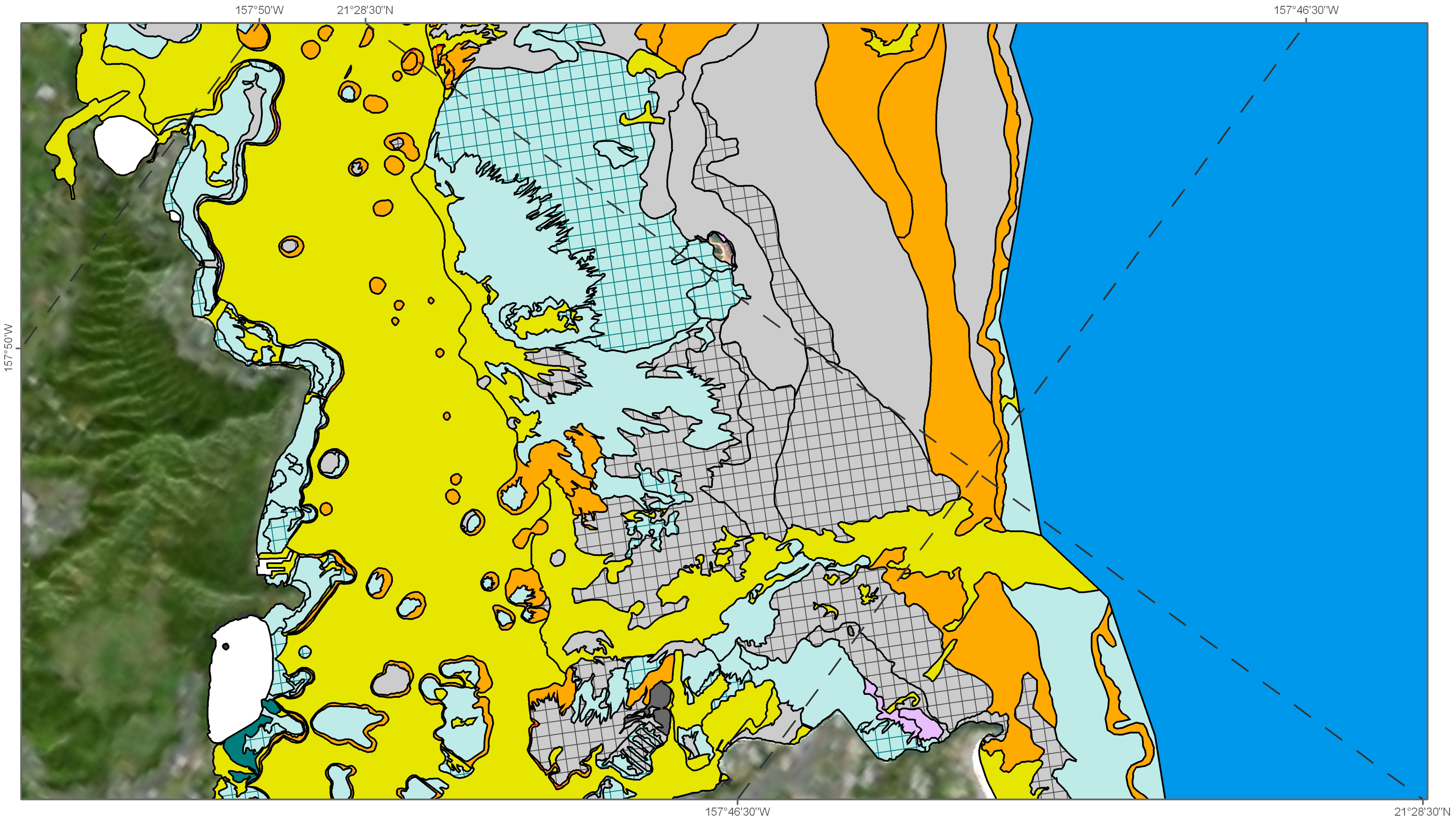
Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 115)


157°50'W
21°28'30"N
157°46'30"W
157°50'W
157°46'30"W
21°28'30"N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
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131
0 5 10
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0 50 100
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

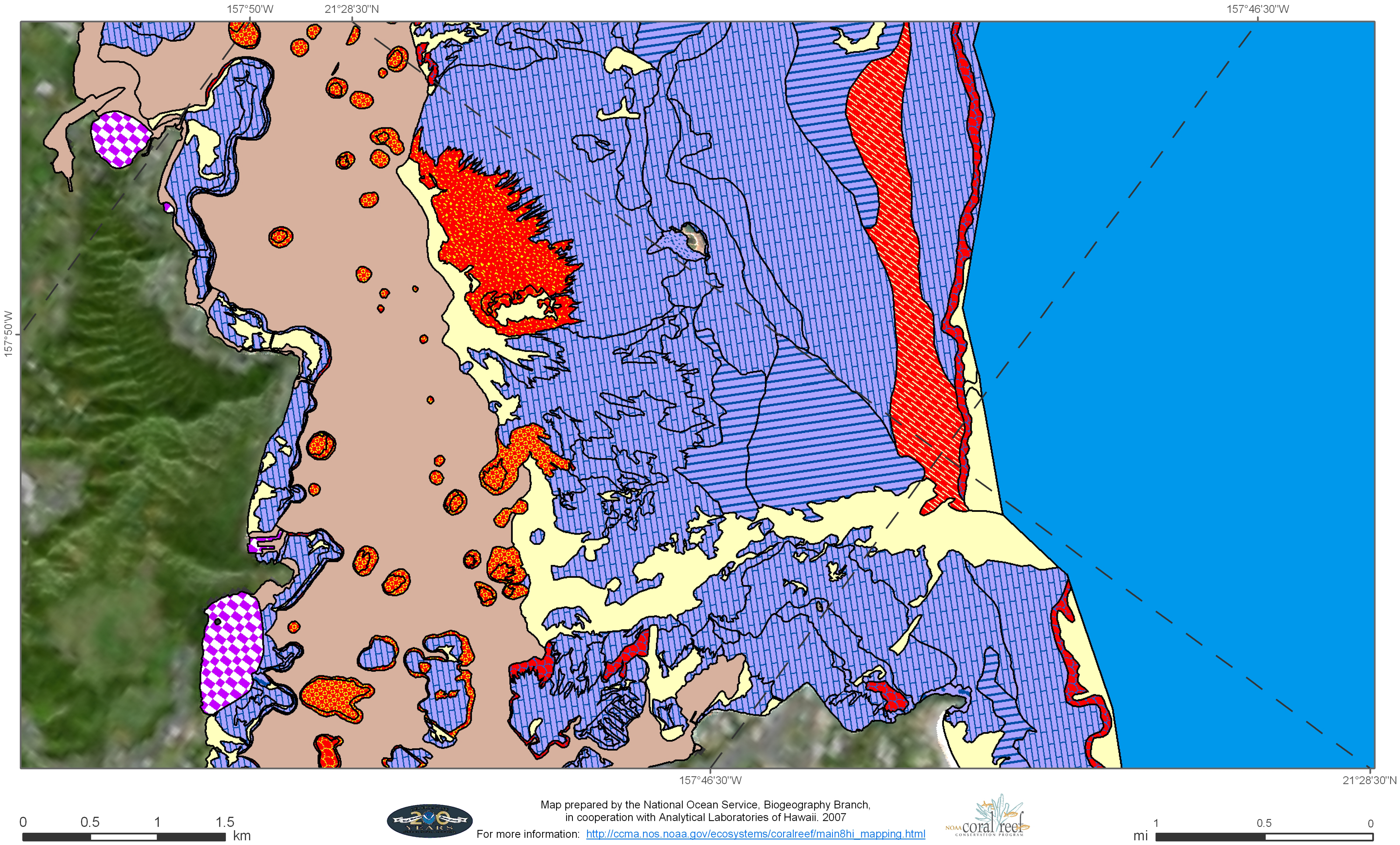
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 115)


157°50'W
21°28'30"N
157°46'30"W
157°50'W
157°46'30"W
21°28'30"N
0
0.5
1
1.5
km
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mi

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10
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Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
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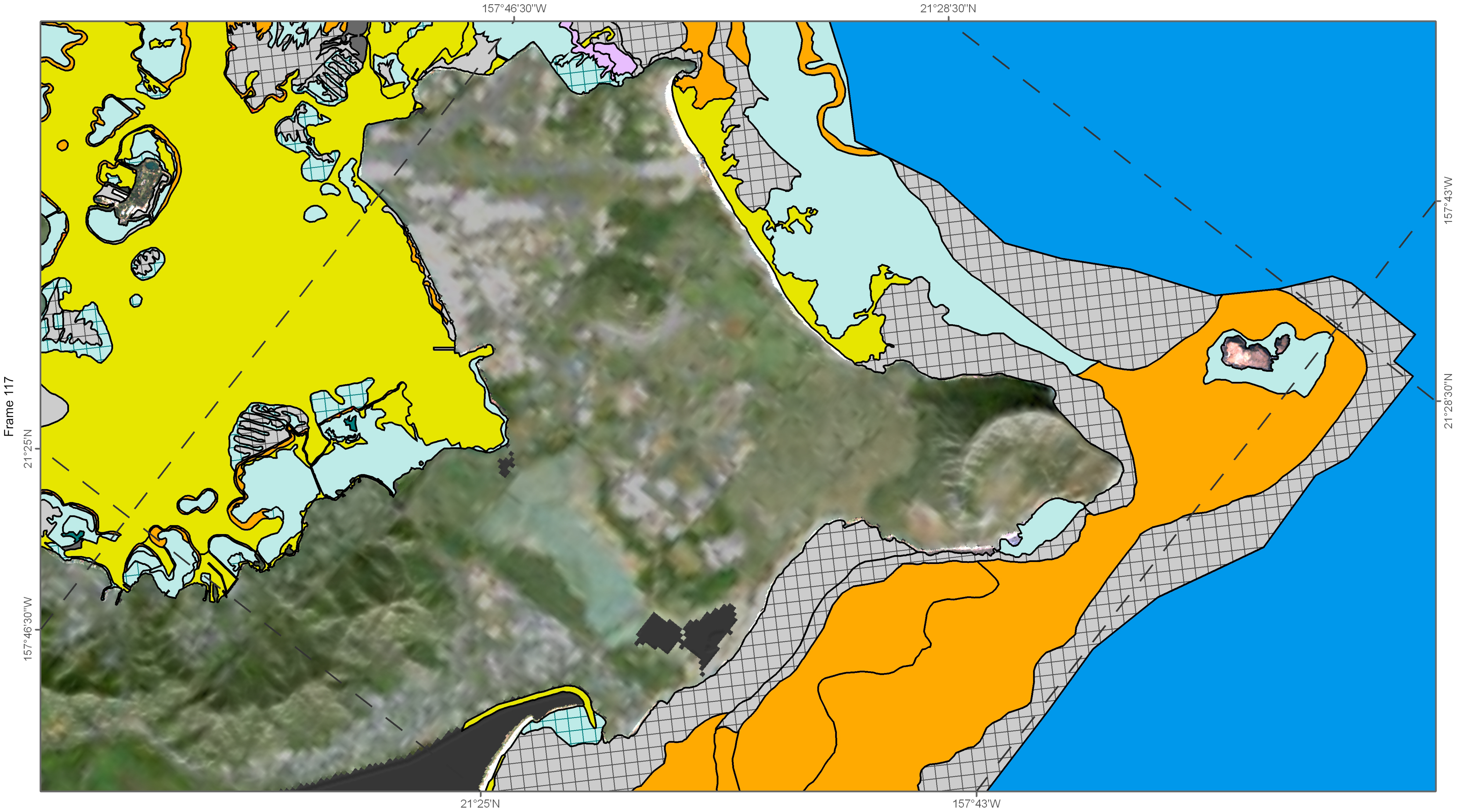
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 116)


157°46'30"W
21°28'30"N
157°43'W
21°28'30"N
Frame 117
21°25'N
157°46'30"W
21°25'N
157°43'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10 km
0 50 100 km
N
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▢ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▢ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▢ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

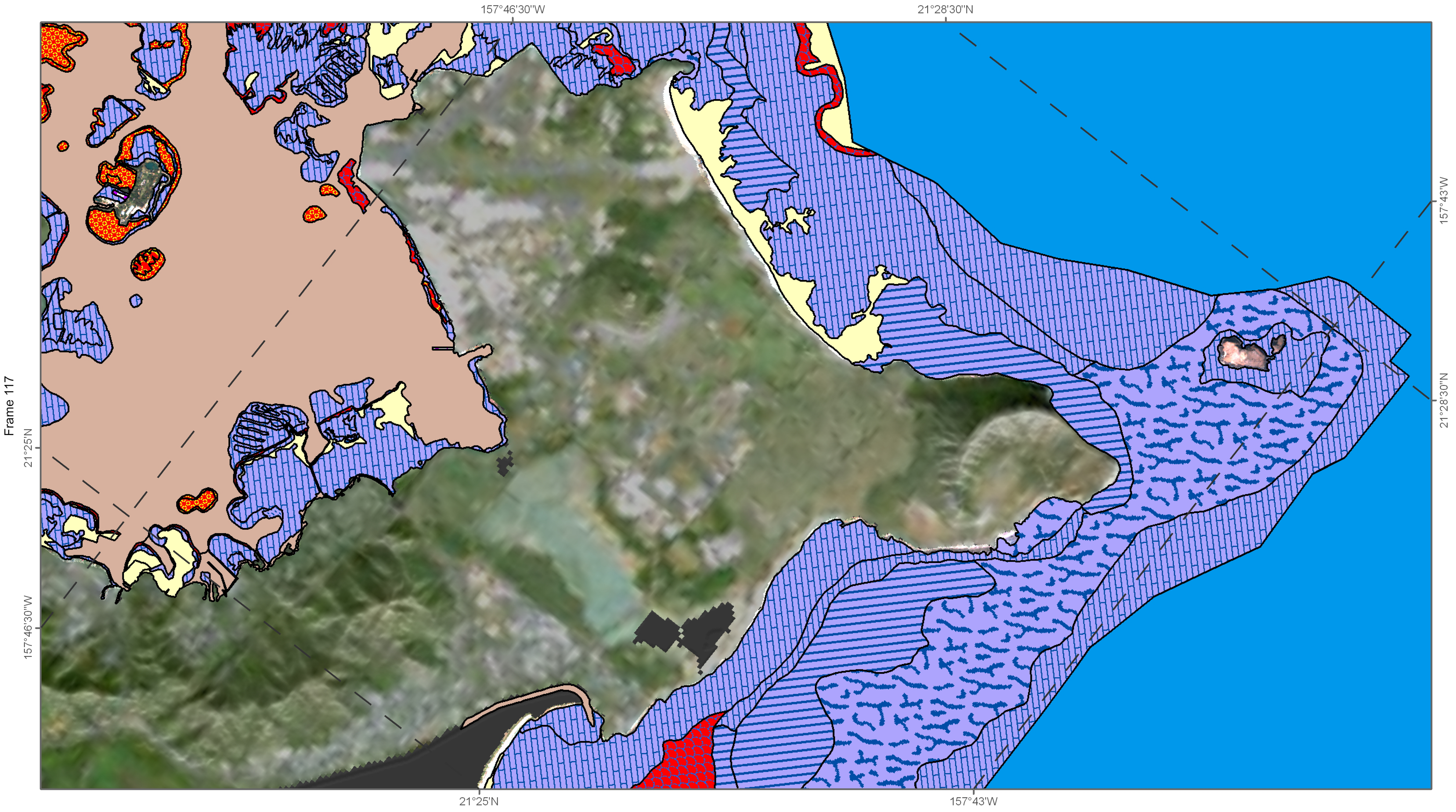
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 116)


157°46'30"W
21°28'30"N
157°43'W
21°28'30"N
Frame 117
21°25'N
157°46'30"W
21°25'N
157°43'W
0
0.5
1
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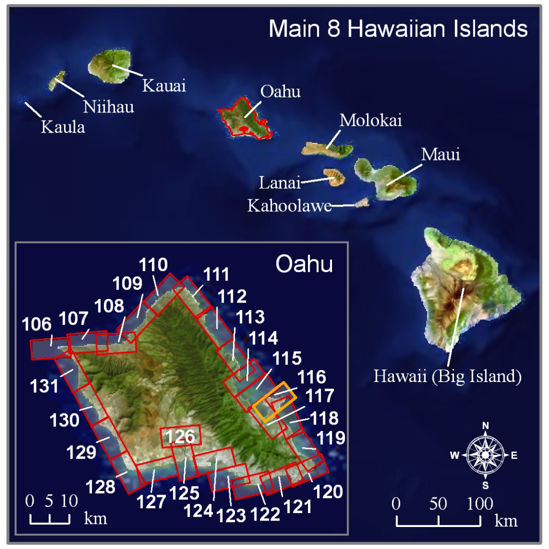
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 50 100
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E
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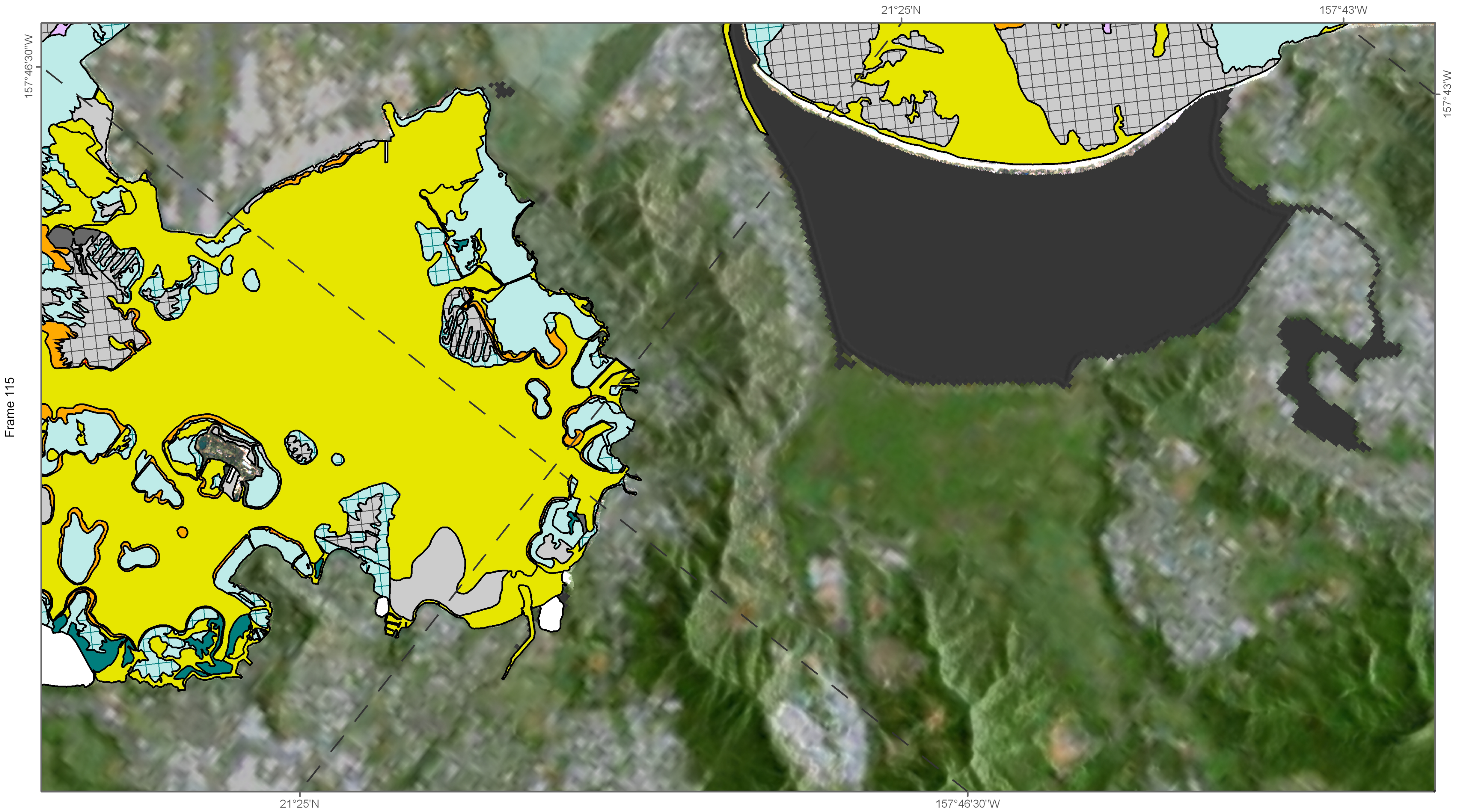
Geomorphological Structure Types

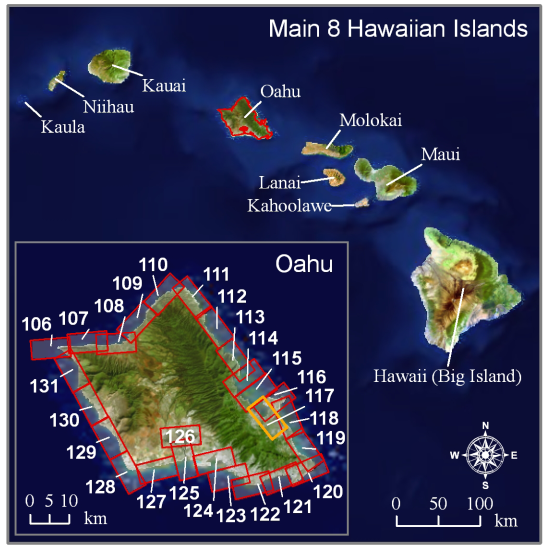
- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 117)


21°25'N
157°43'W
157°46'30"W
157°43'W
Frame 115
21°25'N
157°46'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
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124
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122
0 5 10
km
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0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

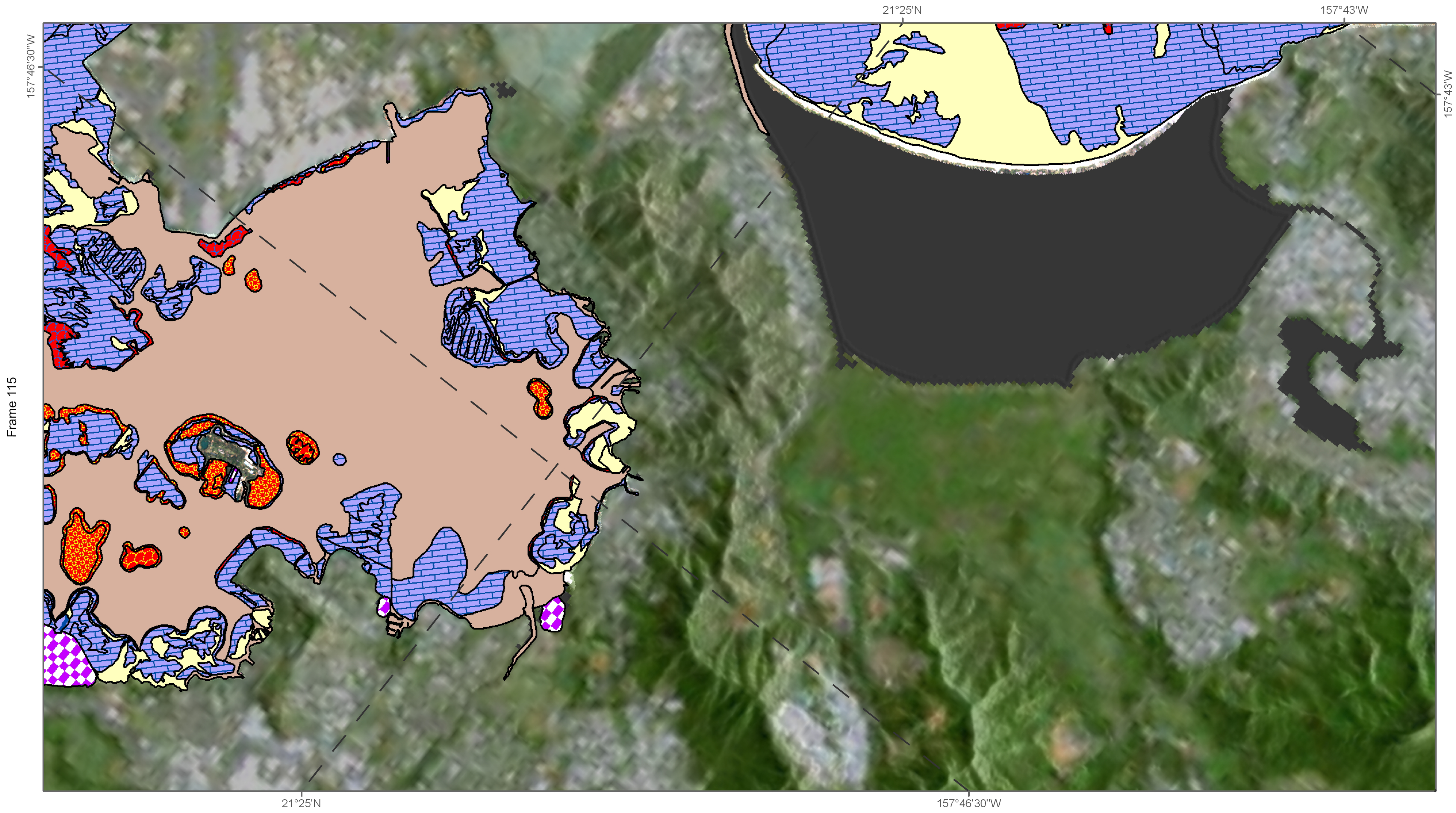
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 117)


21°25'N
157°43'W
157°46'30"W
157°43'W
Frame 115
21°25'N
157°46'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
106
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131
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

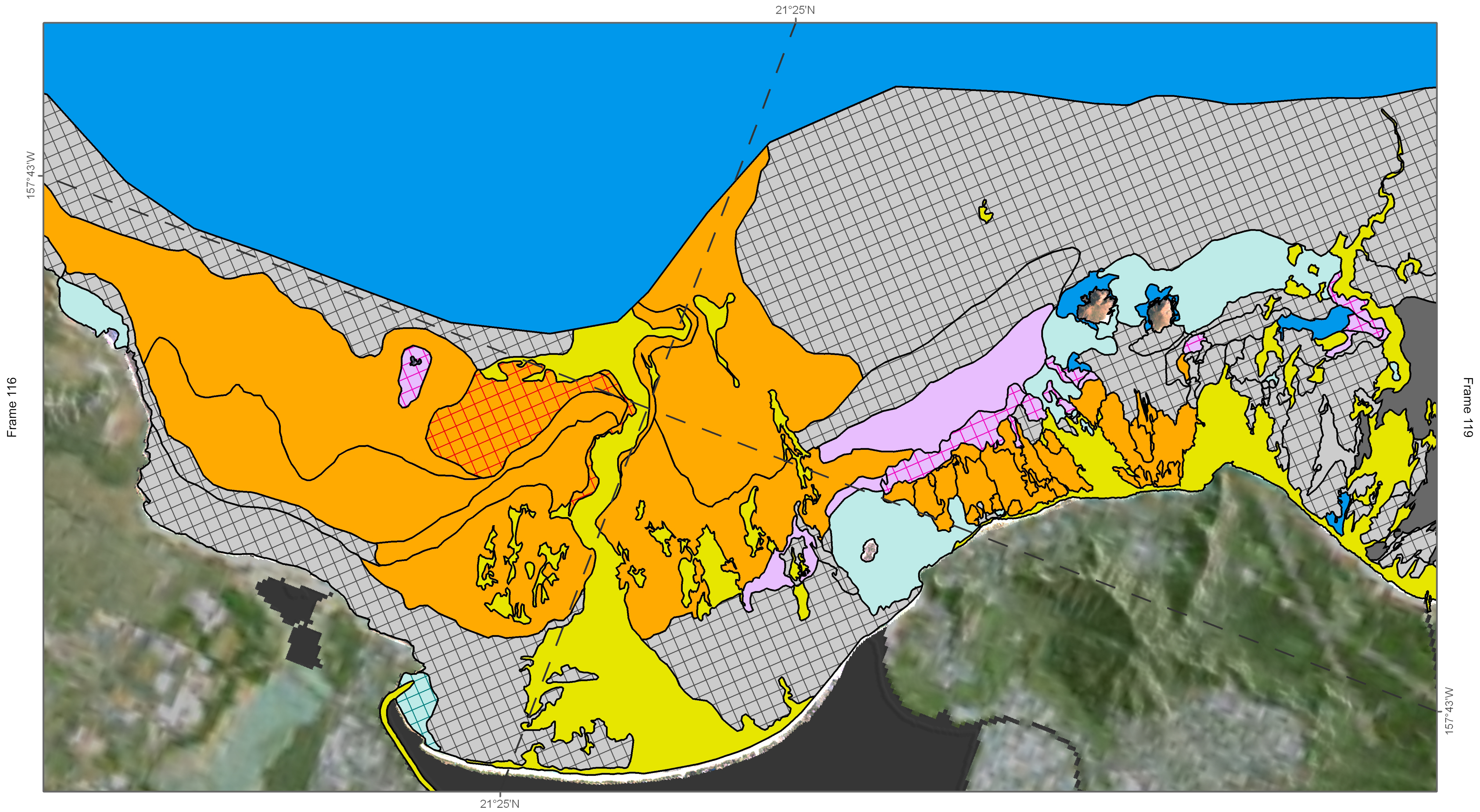
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 118)


21°25'N
157°43'W
Frame 116
Frame 119
157°43'W
21°25'N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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123
122
0 5 10
km
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km
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Biological Cover Types

🟧 Coral 10%-<50%
▨ Coral 50%-<90%
🟥 Coral 90%-100%
▨ Seagrass 10%-<50%
⬜ Macroalgae 10%-<50%
▨ Macroalgae 50%-<90%
⬛ Macroalgae 90%-100%
⬜ Coralline Algae 10%-<50%
▨ Coralline Algae 50%-<90%
⬜ Turf 10%-<50%
▨ Turf 50%-<90%
⬛ Turf 90%-100%
🟩 Emergent Vegetation 10%-<50%
▨ Emergent Vegetation 50%-<90%
🟩 Emergent Vegetation 90%-100%
🟫 Uncolonized 50%-<90%
🟨 Uncolonized 90%-100%
⬜ Unclassified
🟦 Unknown

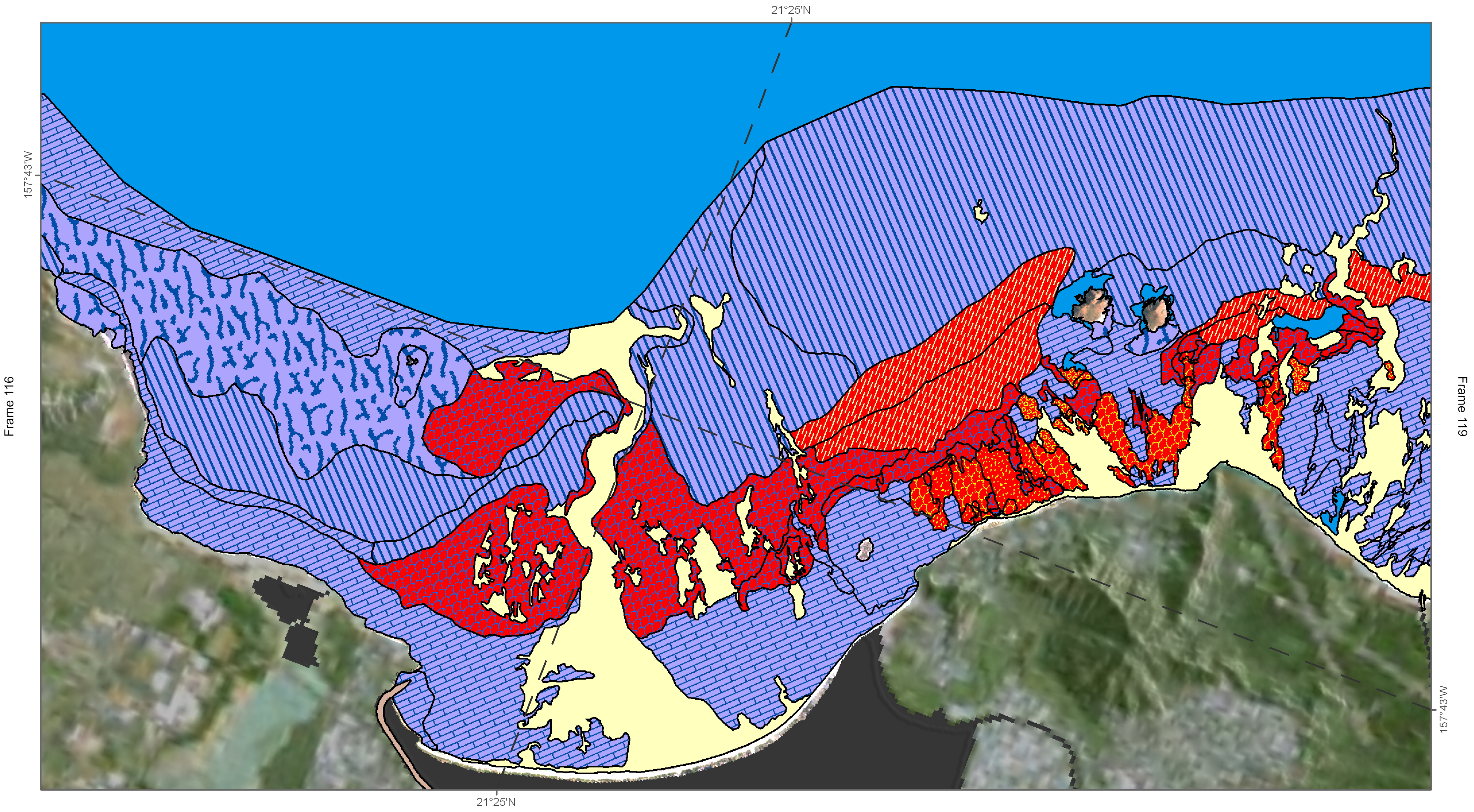
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

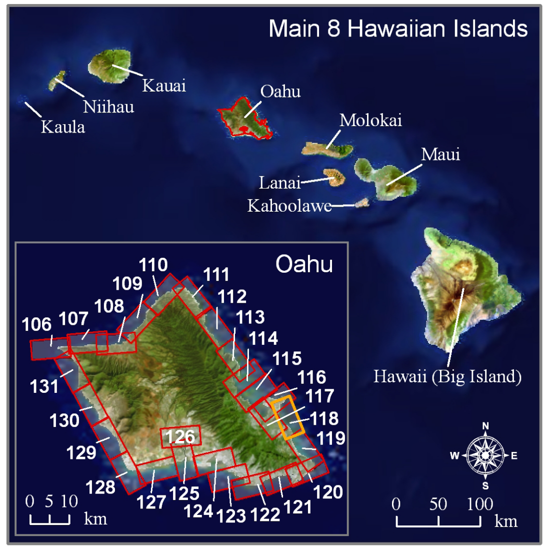
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 118)


21°25'N
157°43'W
Frame 116
Frame 119
157°43'W
21°25'N

0 0.5 1 1.5
km


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
110
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120
0 5 10
km
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km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
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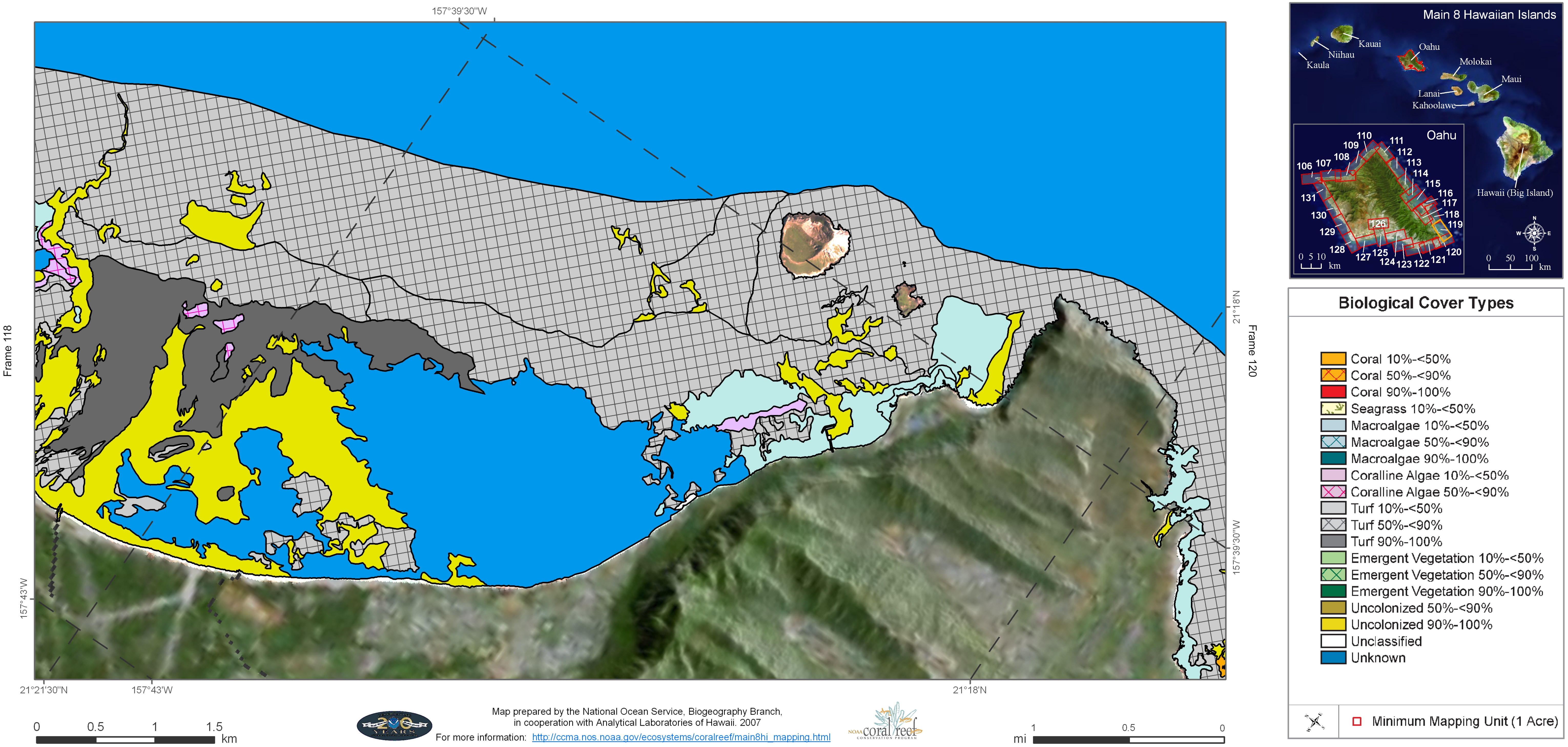
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 119)


157°39'30"W
Frame 118
Frame 120
21°18'N
157°39'30"W
157°43'W
21°21'30"N
157°43'W
21°18'N
0
0.5
1
1.5
km
1
0.5
0
mi
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10
km
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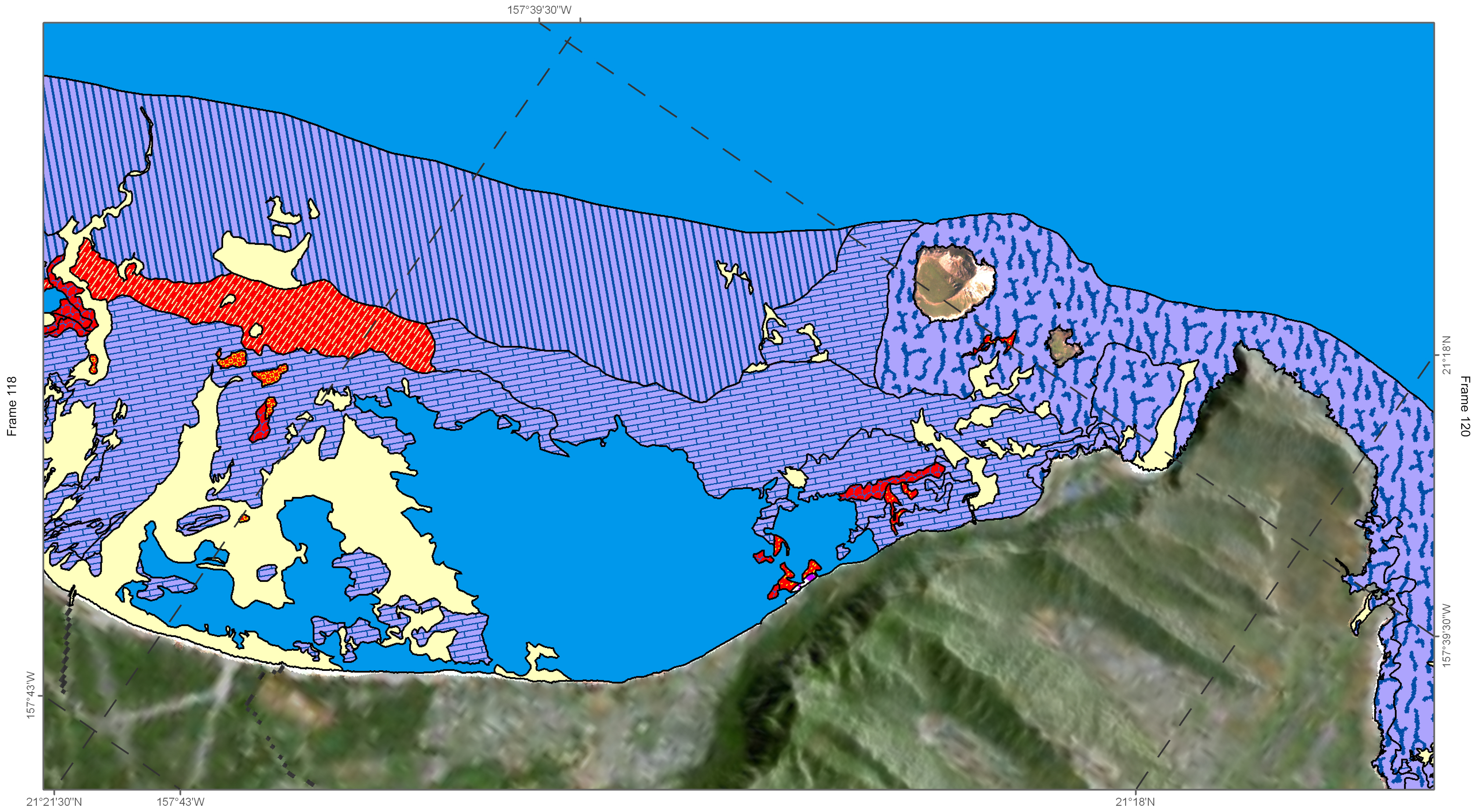
Biological Cover Types
Coral 10%-<50%
Coral 50%-<90%
Coral 90%-100%
Seagrass 10%-<50%
Macroalgae 10%-<50%
Macroalgae 50%-<90%
Macroalgae 90%-100%
Coralline Algae 10%-<50%
Coralline Algae 50%-<90%
Turf 10%-<50%
Turf 50%-<90%
Turf 90%-100%
Emergent Vegetation 10%-<50%
Emergent Vegetation 50%-<90%
Emergent Vegetation 90%-100%
Uncolonized 50%-<90%
Uncolonized 90%-100%
Unclassified
Unknown
Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 119)


157°39'30"W
21°18'N
Frame 120
157°39'30"W
Frame 118
157°43'W
21°21'30"N
157°43'W
21°18'N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Oahu
106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131
0 5 10 km
N E S W

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

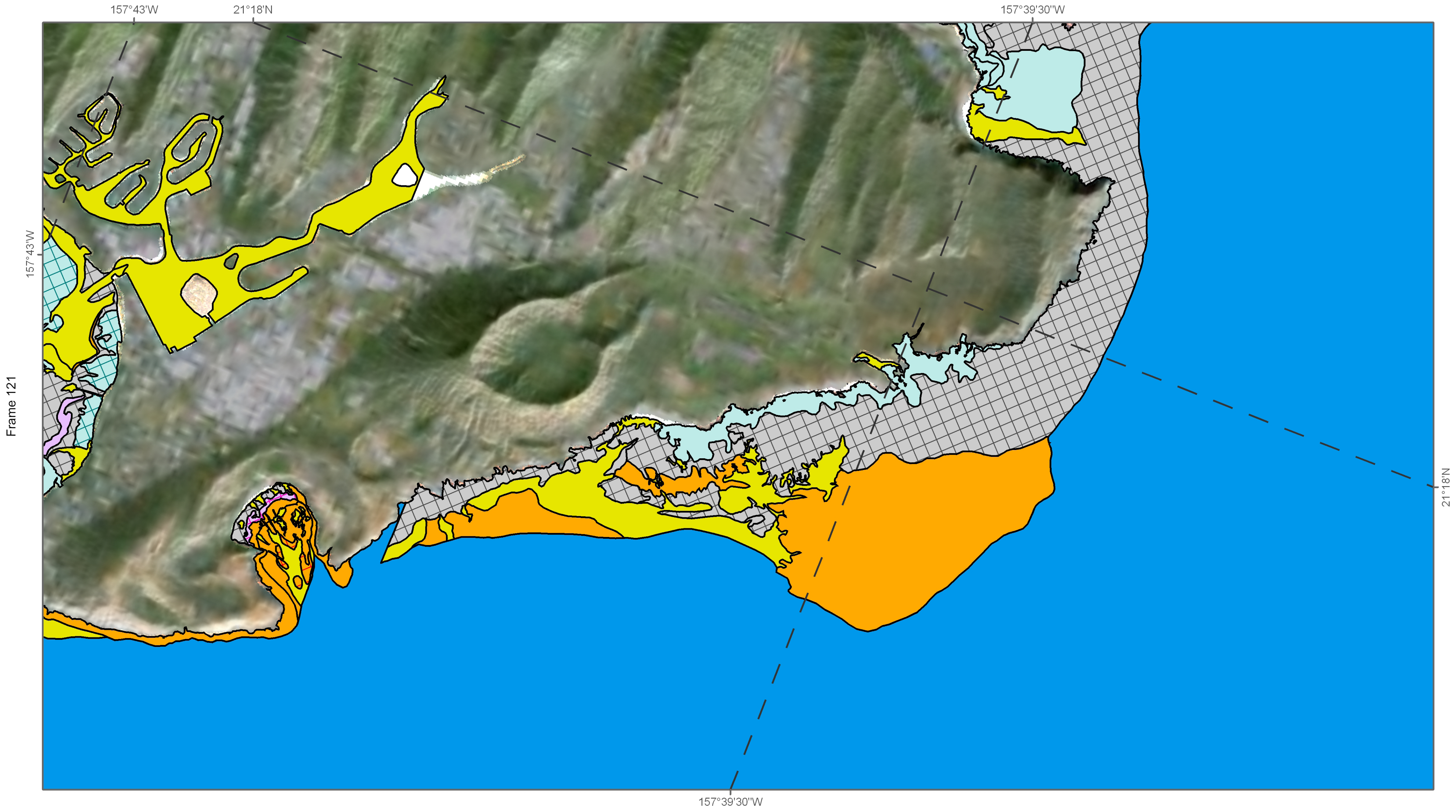
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 120)



157°43'W
21°18'N
157°39'30"W
157°43'W
Frame 121
21°18'N
157°39'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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122
0 5 10
km
0 50 100
km
N
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

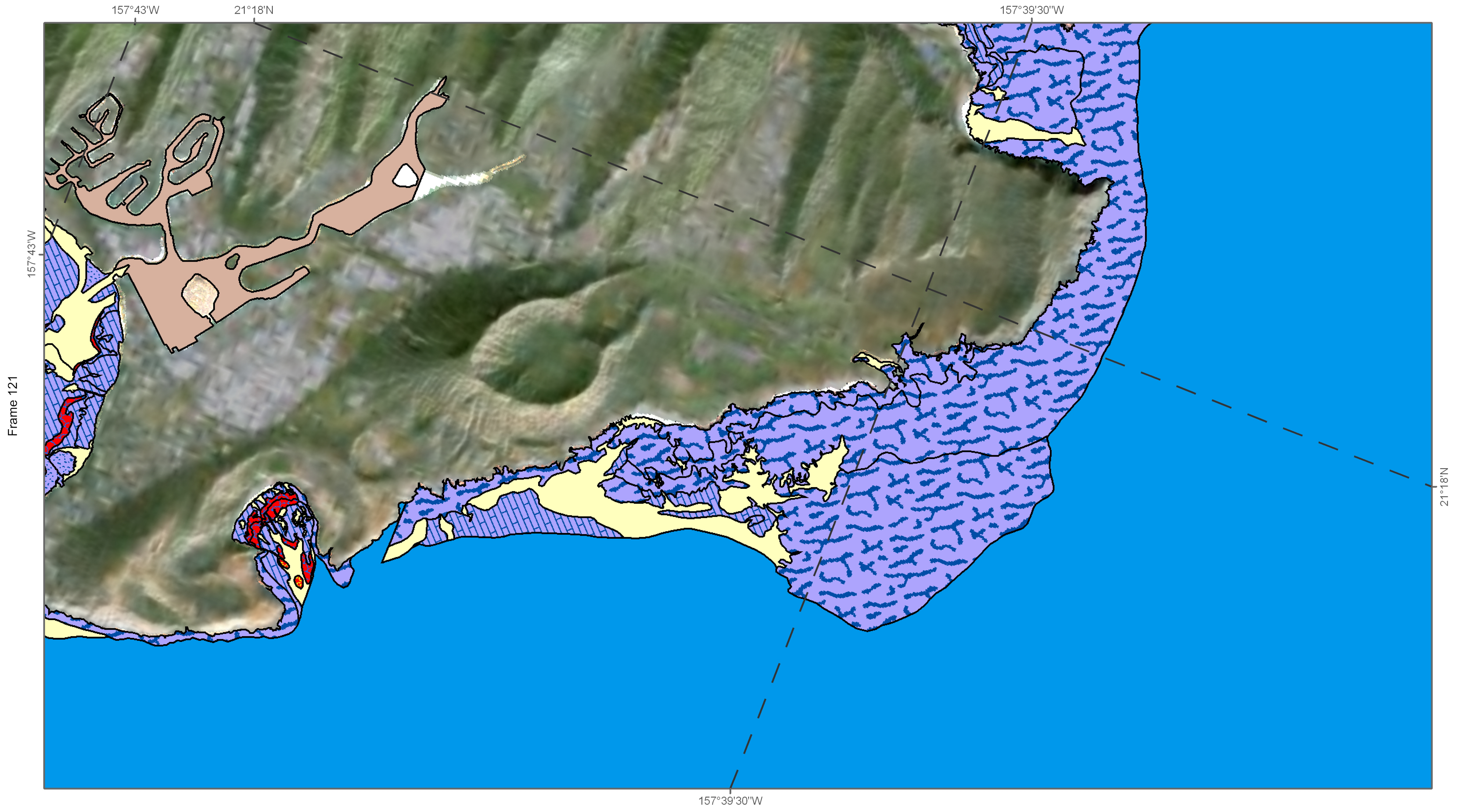
☐ Minimum Mapping Unit (1 Acre)

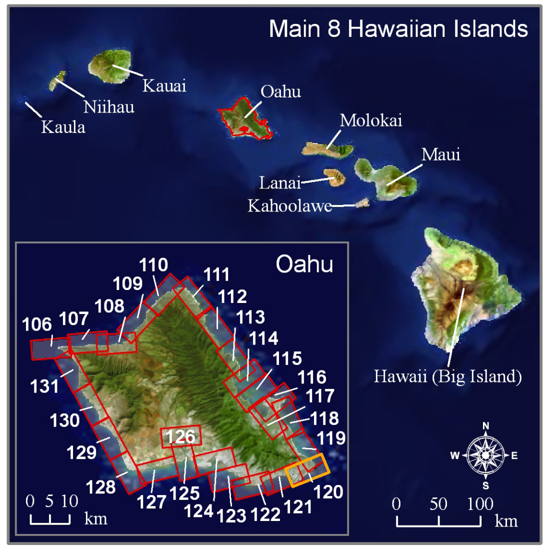
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 120)


157°43'W
21°18'N
157°39'30"W
157°43'W
Frame 121
21°18'N
157°39'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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120
0 5 10
km
0 50 100
km

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

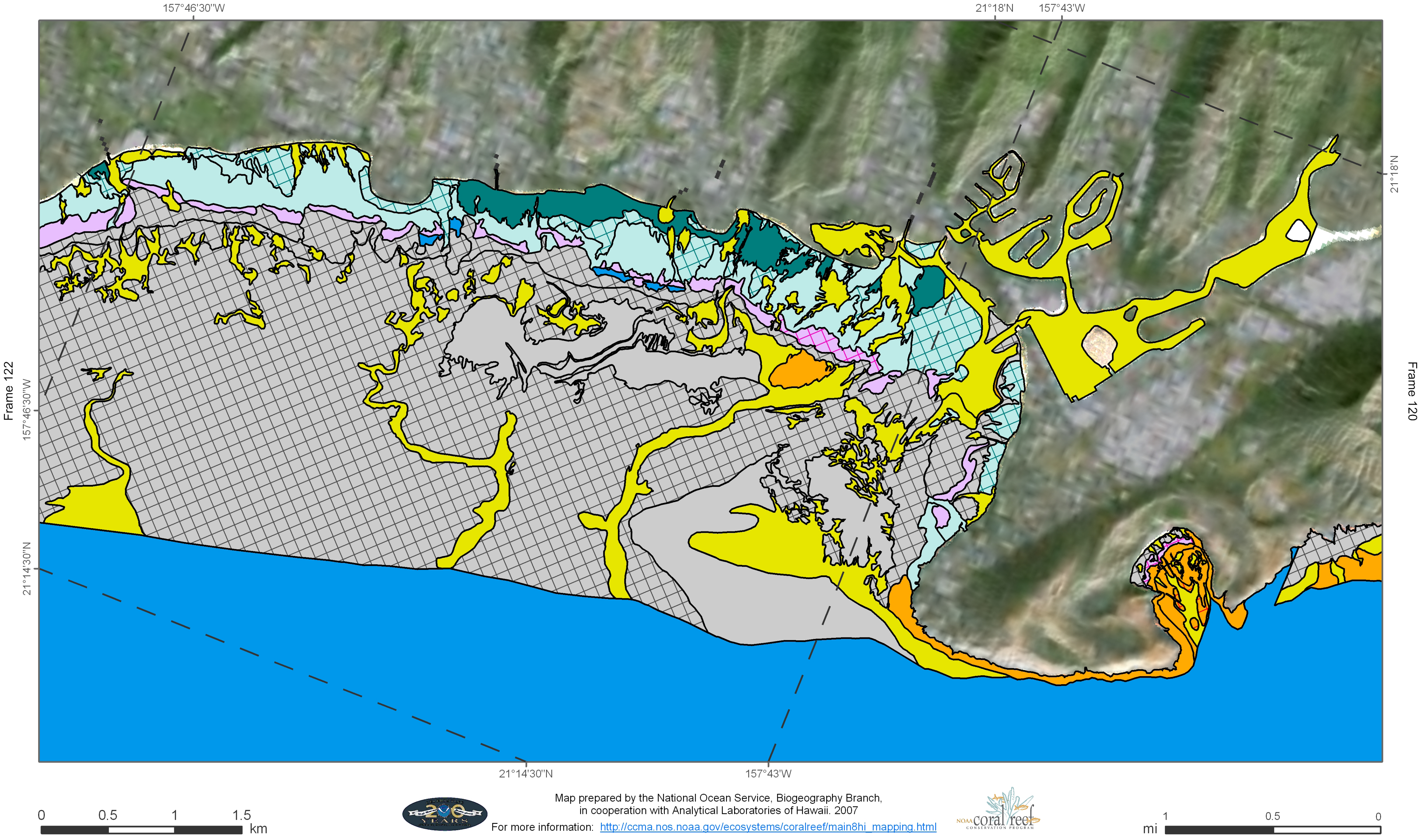
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 121)


157°46'30"W
21°18'N
157°43'W
21°18'N
Frame 122
157°46'30"W
21°14'30"N
Frame 120
21°14'30"N
157°43'W
0
0.5
1
1.5
km
1
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mi

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10
km
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km
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Biological Cover Types

🟧 Coral 10%-<50%
▨ Coral 50%-<90%
🟥 Coral 90%-100%
▨ Seagrass 10%-<50%
▭ Macroalgae 10%-<50%
▨ Macroalgae 50%-<90%
■ Macroalgae 90%-100%
▭ Coralline Algae 10%-<50%
▨ Coralline Algae 50%-<90%
▭ Turf 10%-<50%
▨ Turf 50%-<90%
■ Turf 90%-100%
🟩 Emergent Vegetation 10%-<50%
▨ Emergent Vegetation 50%-<90%
🟩 Emergent Vegetation 90%-100%
🟫 Uncolonized 50%-<90%
🟨 Uncolonized 90%-100%
☐ Unclassified
🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
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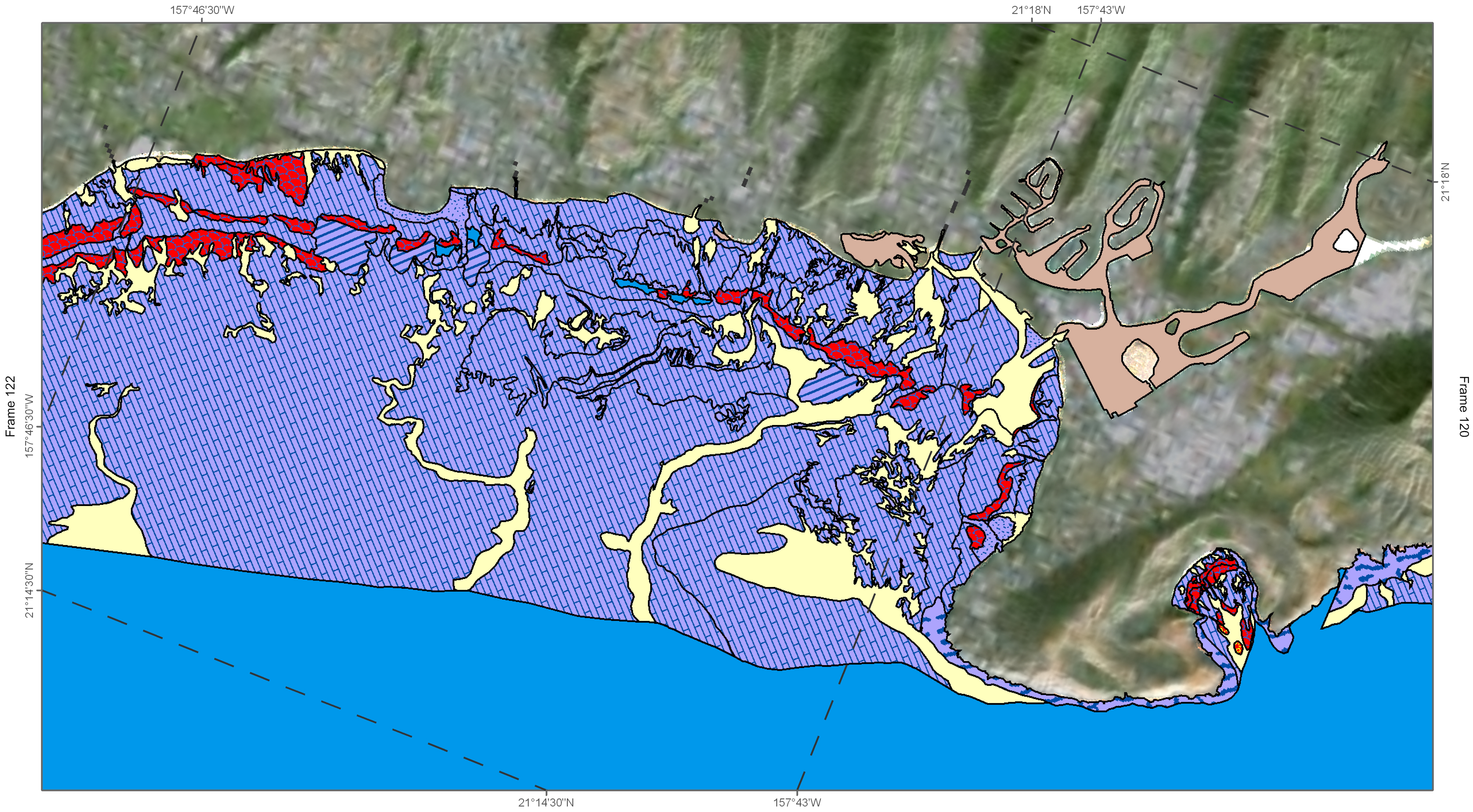
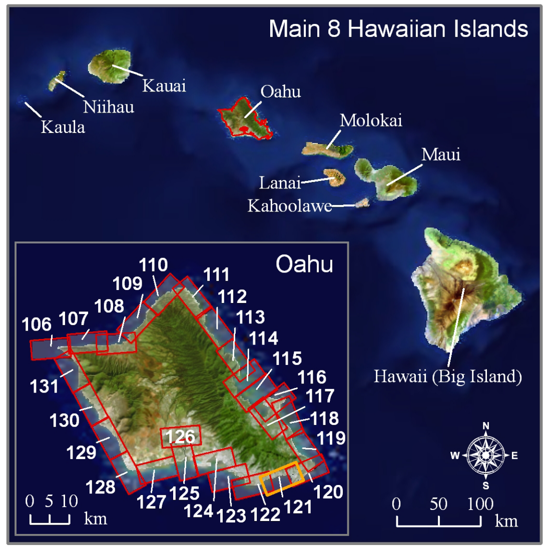
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 121)


157°46'30"W
21°18'N
157°43'W
21°18'N
Frame 122
157°46'30"W
21°14'30"N
Frame 120
21°14'30"N
157°43'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10 km
0 50 100 km

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

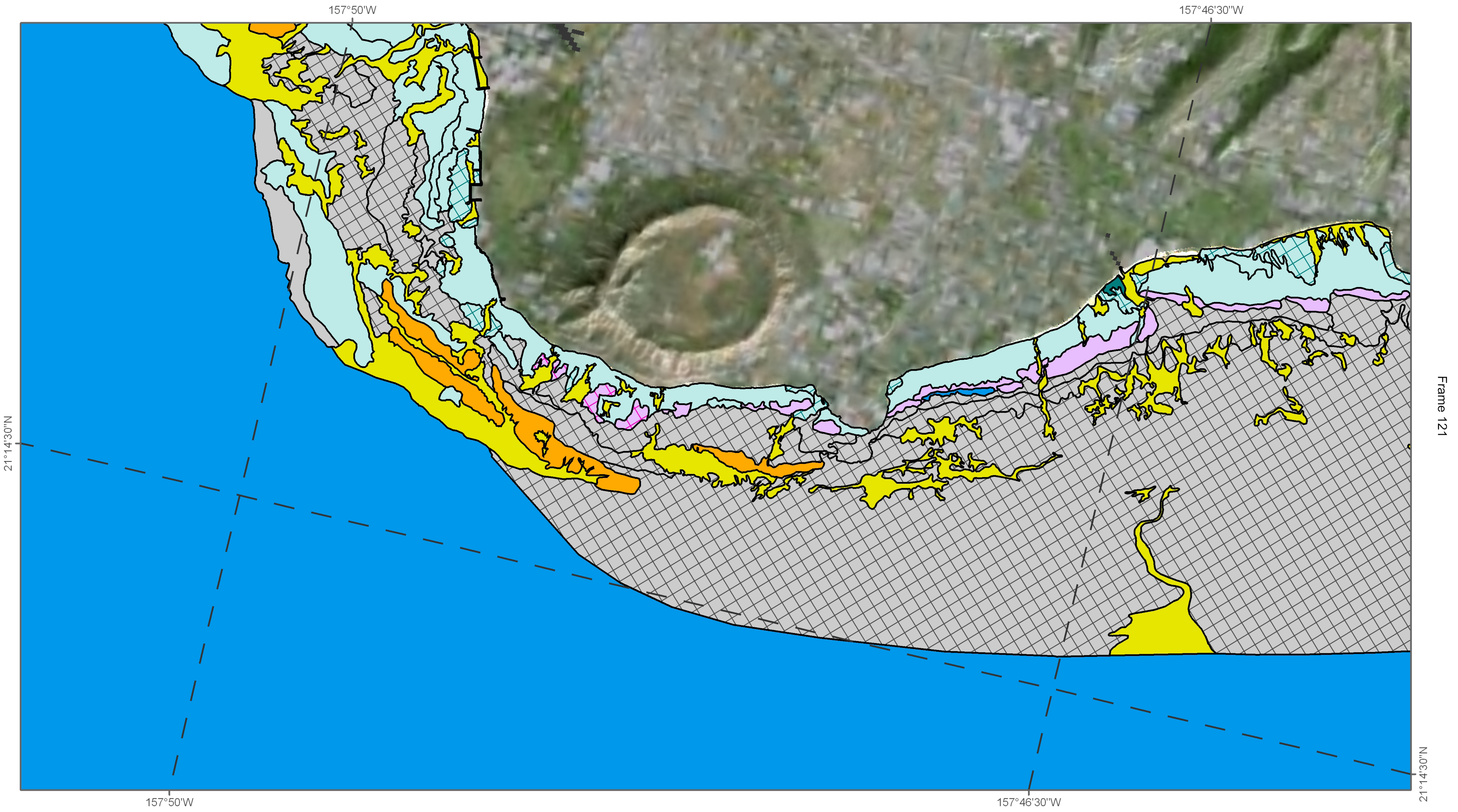
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 122)


157°50'W
157°46'30"W
21°14'30"N
Frame 121
21°14'30"N
157°50'W
157°46'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

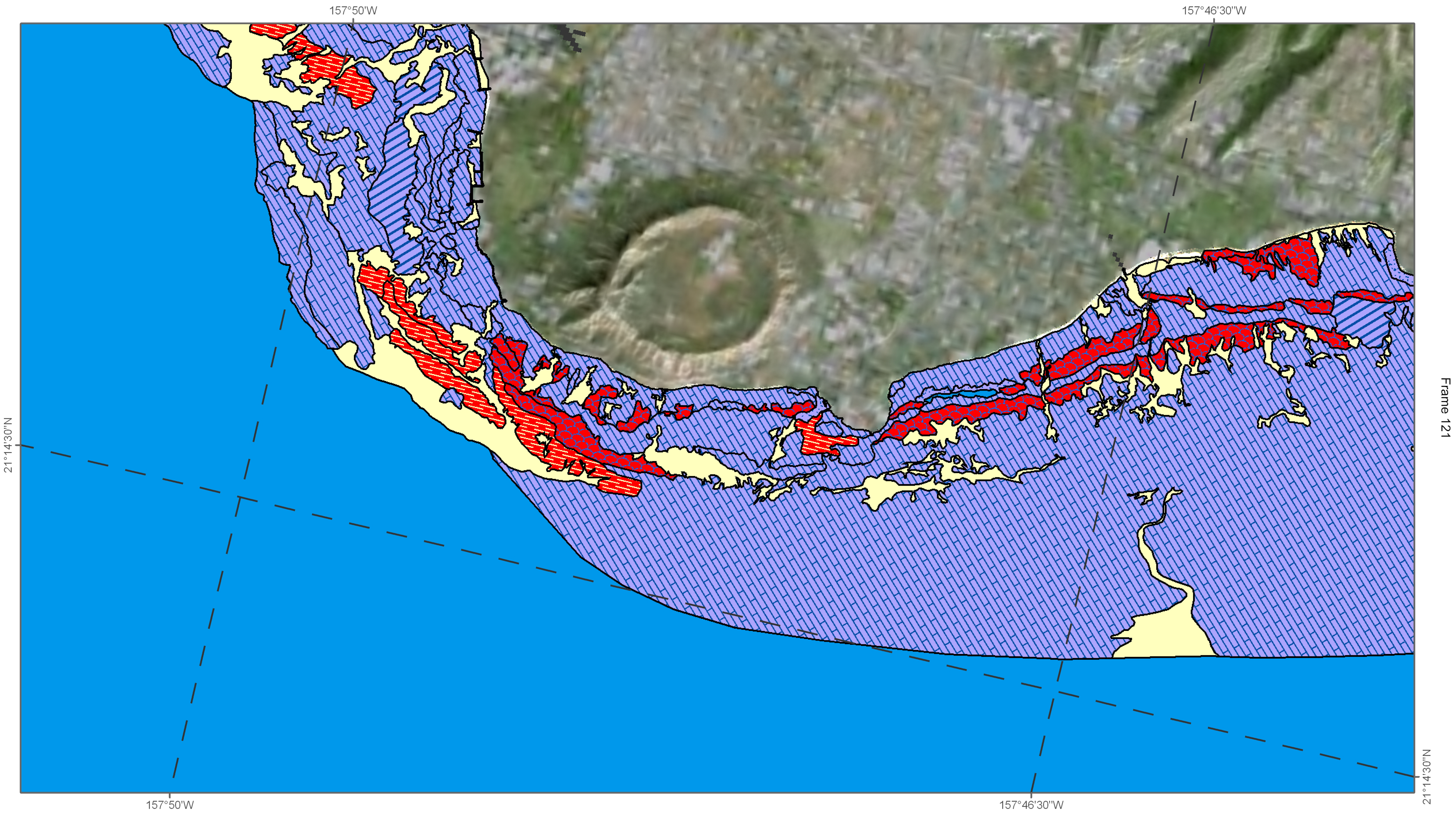
□ Minimum Mapping Unit (1 Acre)

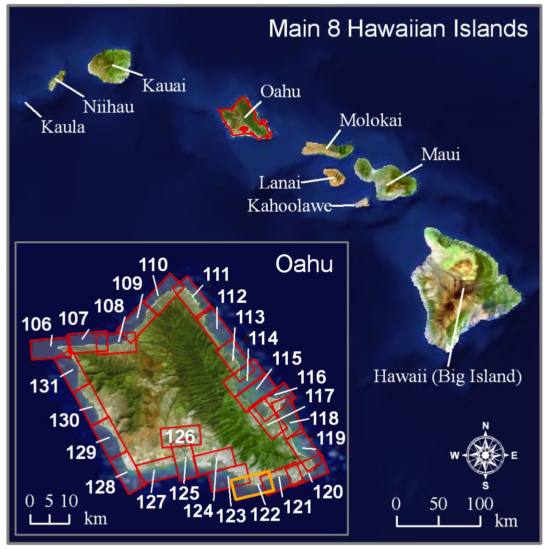
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 122)


157°50'W
157°46'30"W
21°14'30"N
Frame 121
157°50'W
157°46'30"W
21°14'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10
km
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km
N
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E
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Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

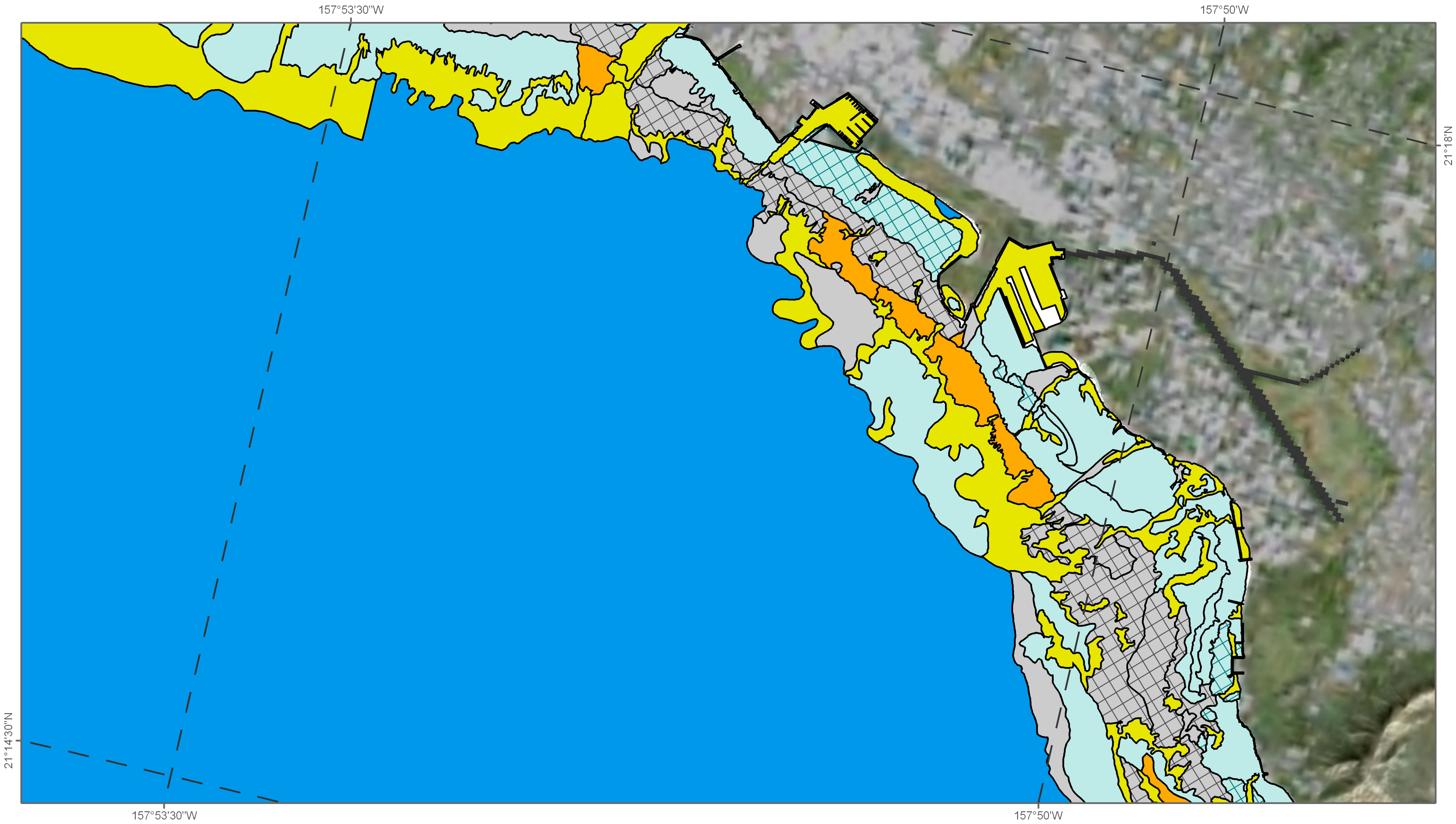
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 123)


157°53'30"W
157°50'W
21°18'N
21°14'30"N
157°53'30"W
157°50'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10
km
0 50 100
km
N
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W

Biological Cover Types

- ■ Coral 10%-<50%
- ▨ Coral 50%-<90%
- ■ Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- ■ Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- ■ Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- ■ Uncolonized 90%-100%
- □ Unclassified
- ■ Unknown

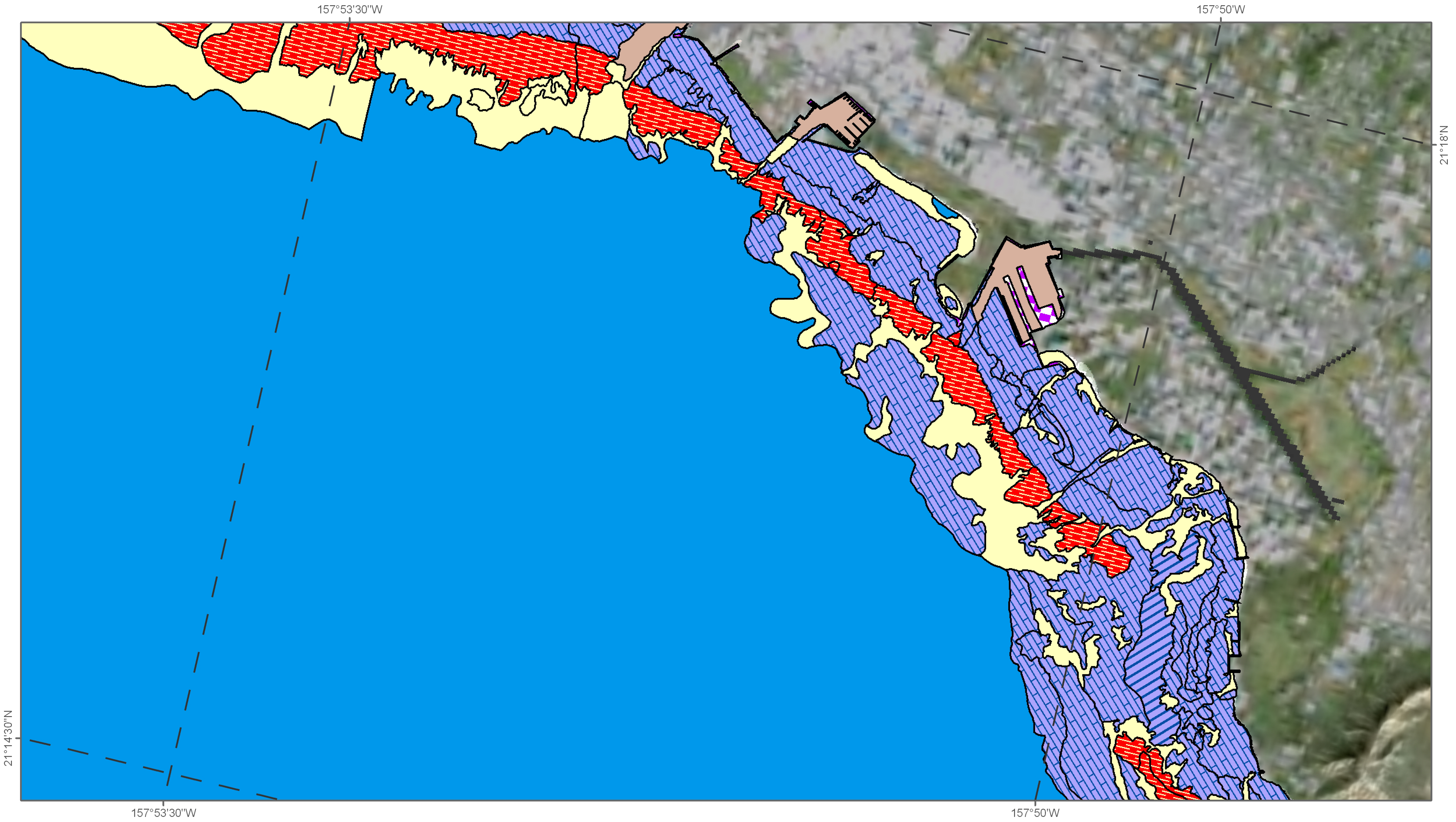
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 123)


157°53'30"W
157°50'W
21°18'N
21°14'30"N
157°53'30"W
157°50'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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128
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130
131
0 5 10 km
0 50 100 km
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Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ■ Unknown

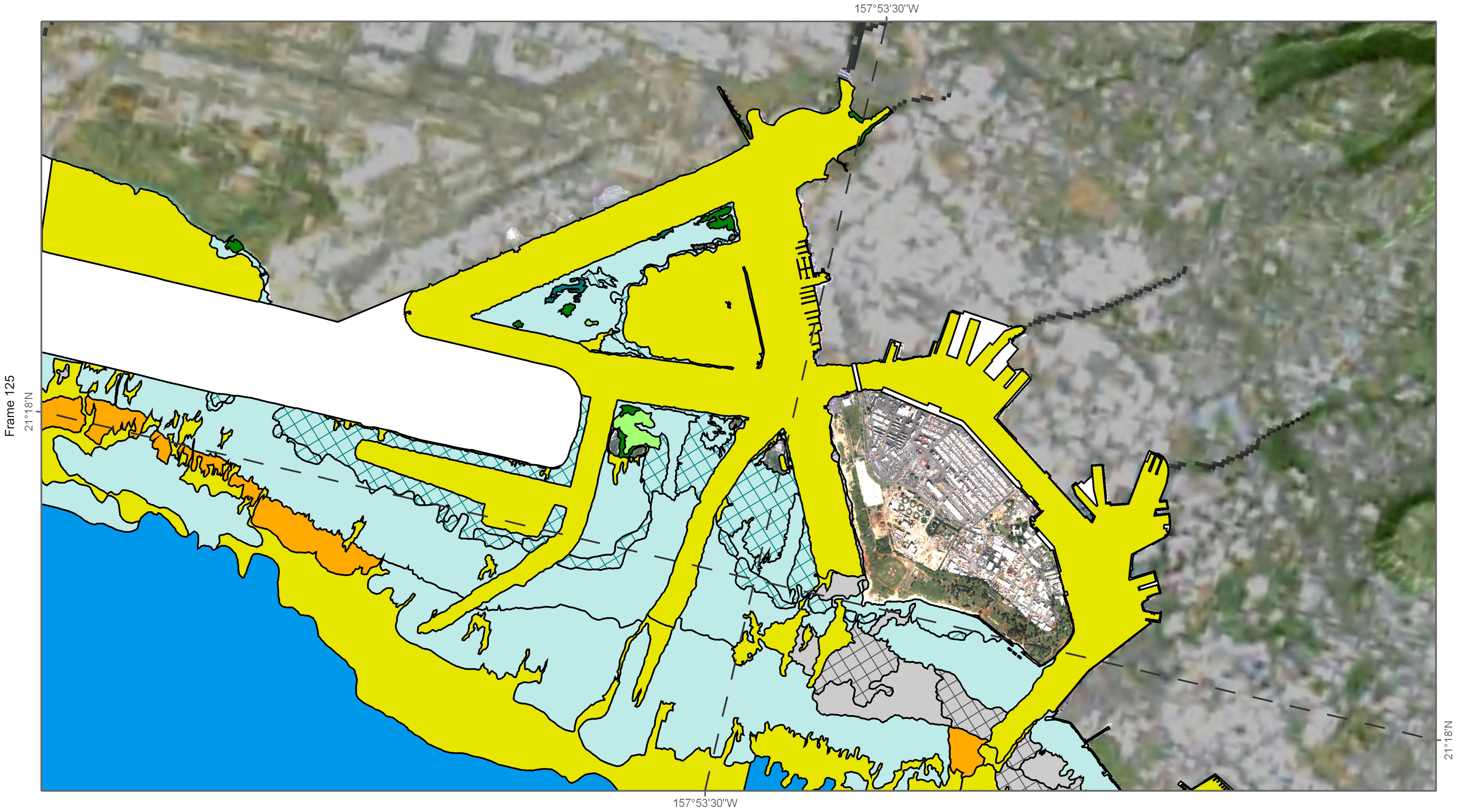
☐ Minimum Mapping Unit (1 Acre)

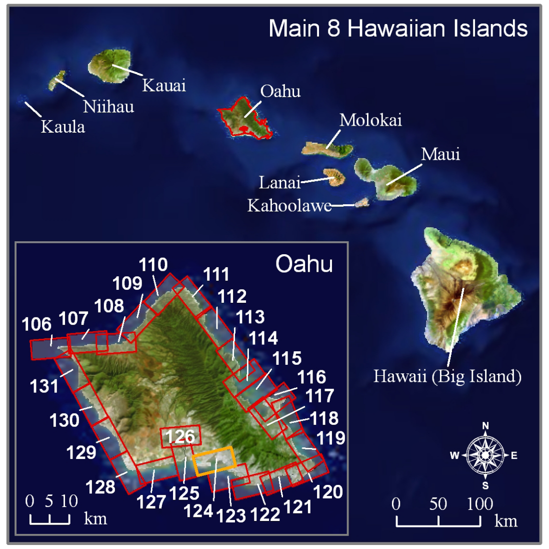
0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 124)


157°53'30"W
Frame 125
21°18'N
21°18'N
157°53'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100
km
Oahu
110
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125
124
123
122
121
0 5 10
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- 🟦 Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- 🟦 Macroalgae 90%-100%
- 🟪 Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

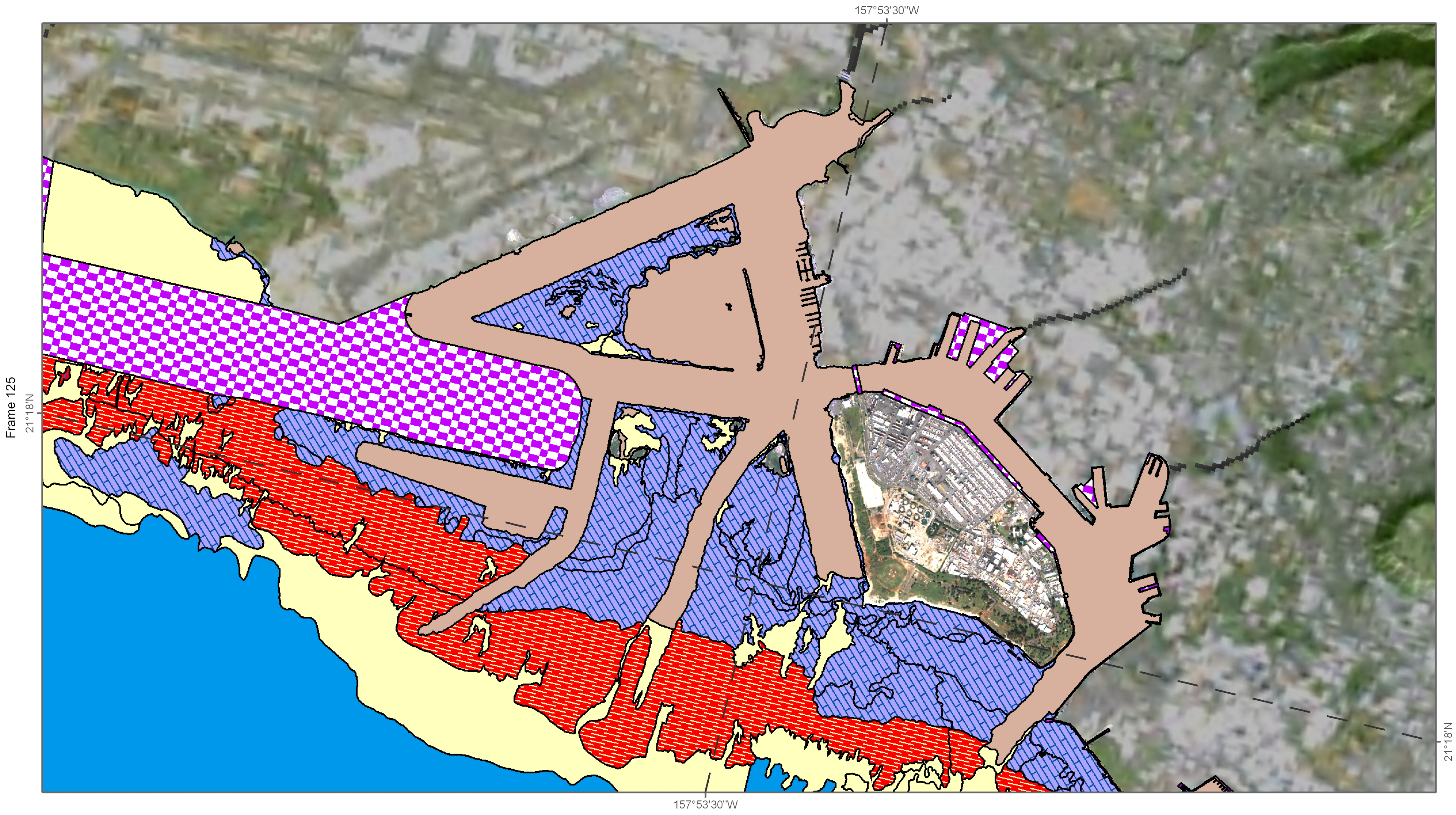
□ Minimum Mapping Unit (1 Acre)

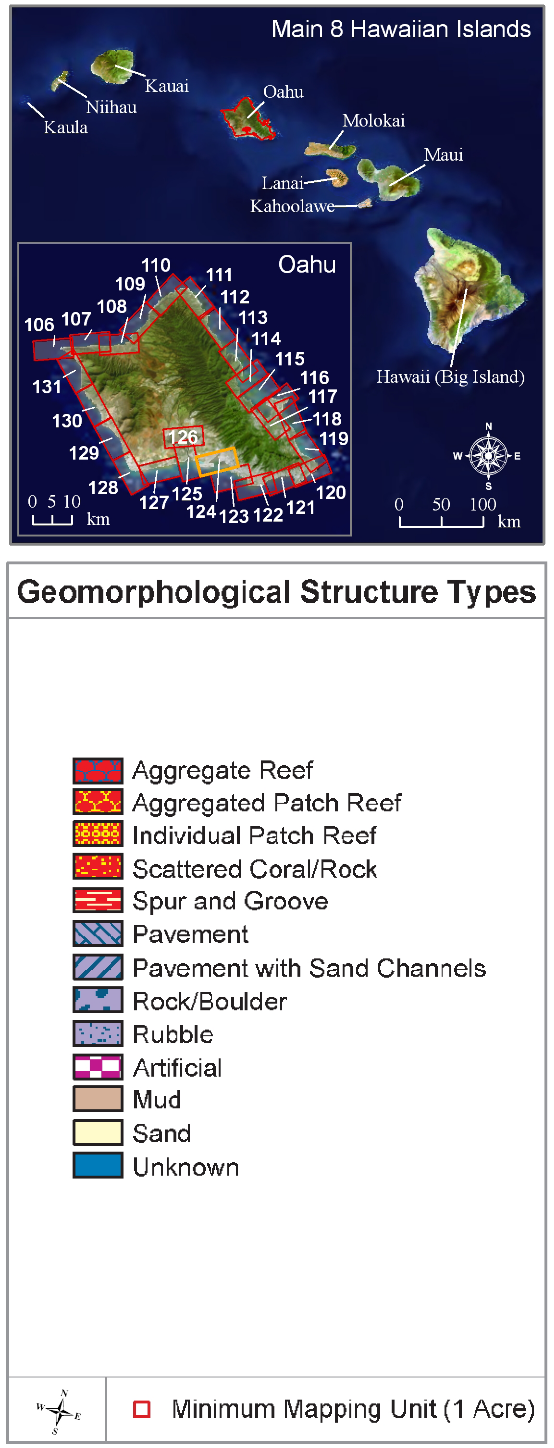
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 124)


157°53'30"W
Frame 125
21°18'N
21°18'N
157°53'30"W

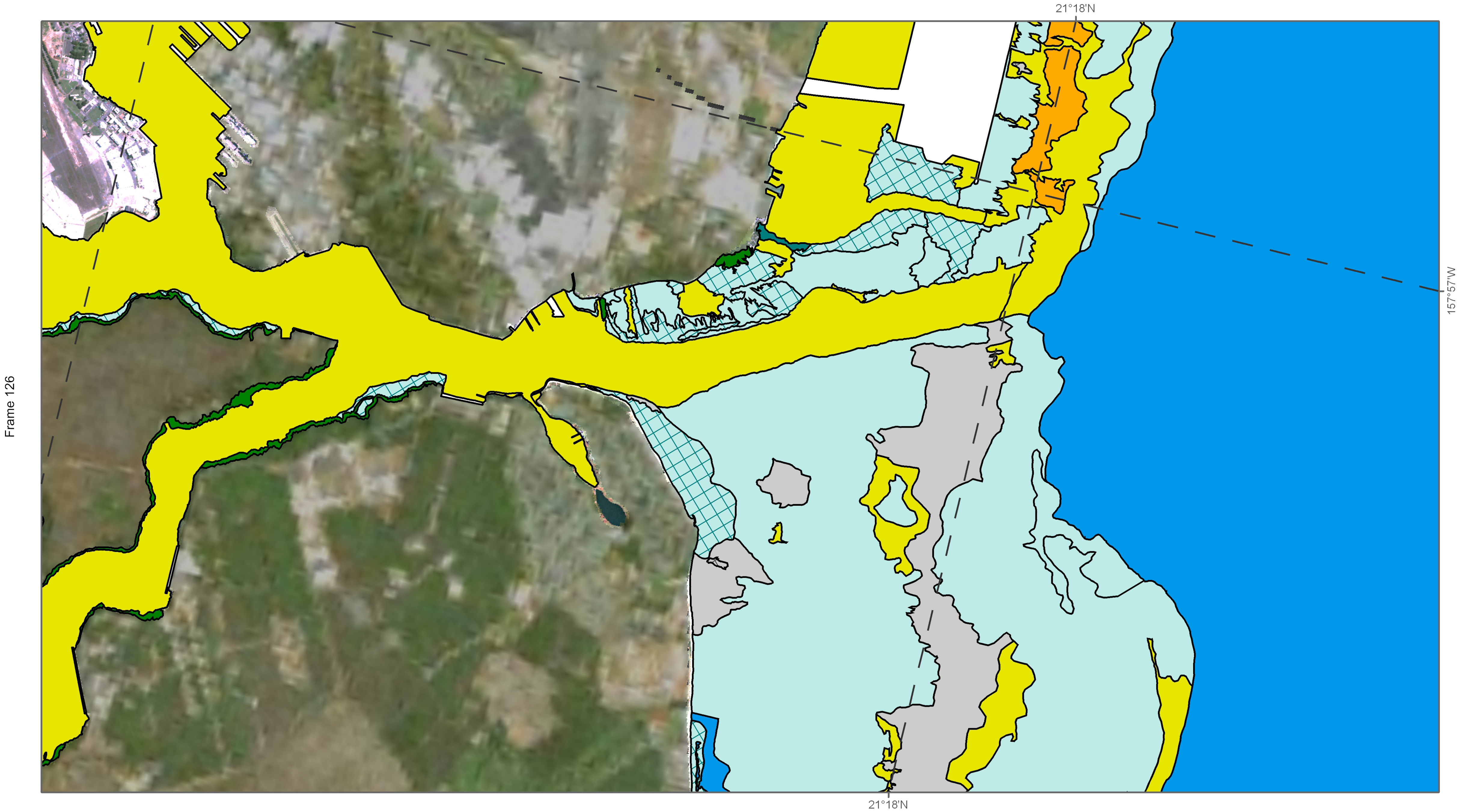

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100
km
Oahu
106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131
0 5 10
km
Geomorphological Structure Types
Aggregate Reef
Aggregated Patch Reef
Individual Patch Reef
Scattered Coral/Rock
Spur and Groove
Pavement
Pavement with Sand Channels
Rock/Boulder
Rubble
Artificial
Mud
Sand
Unknown
Minimum Mapping Unit (1 Acre)

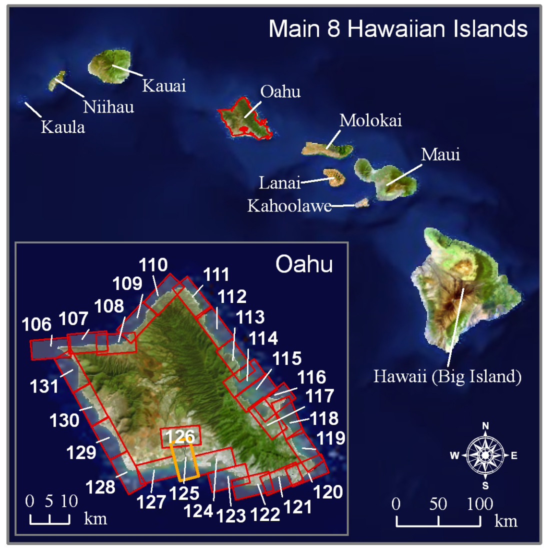
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi
1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 125)


21°18'N
157°57'W
Frame 126
21°18'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

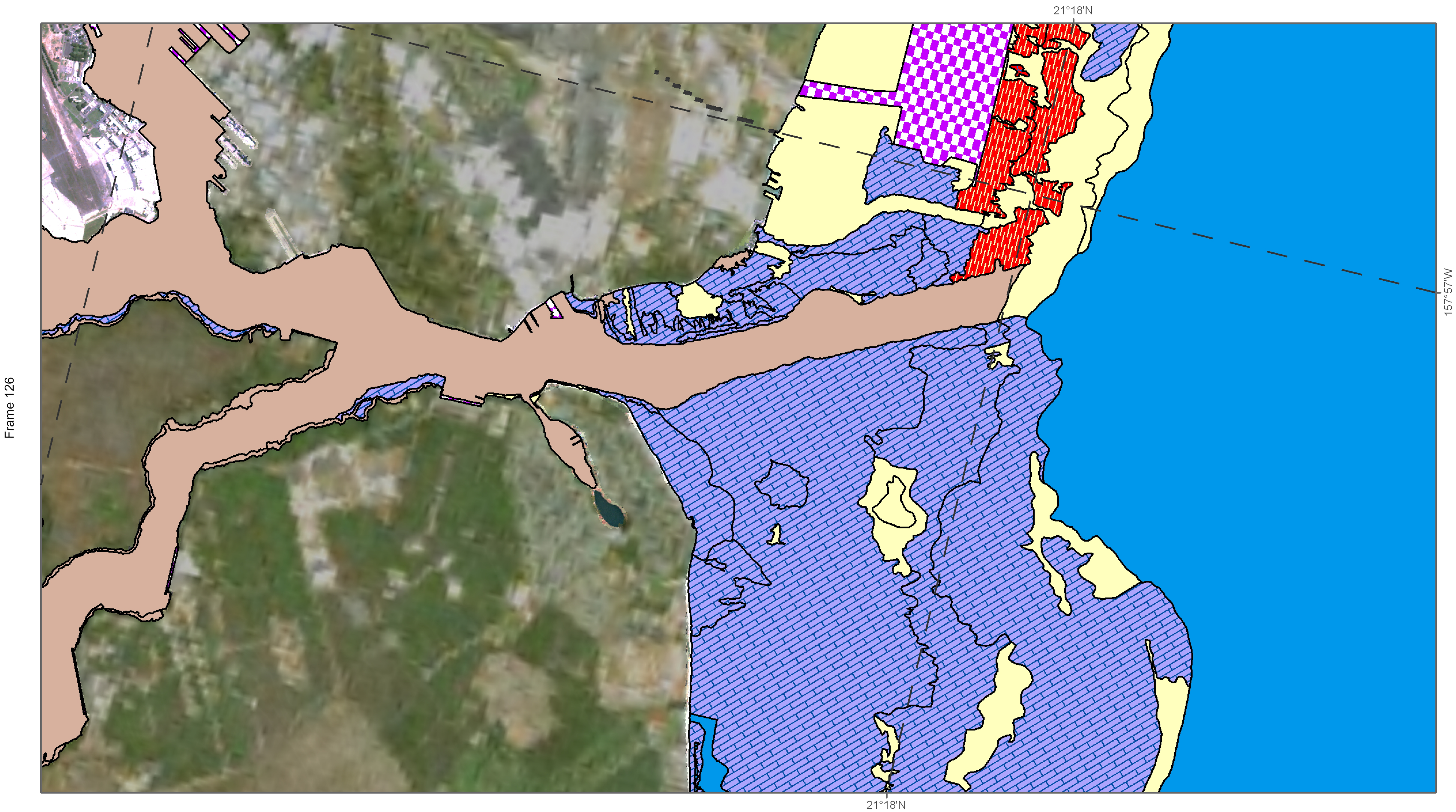
☐ Minimum Mapping Unit (1 Acre)

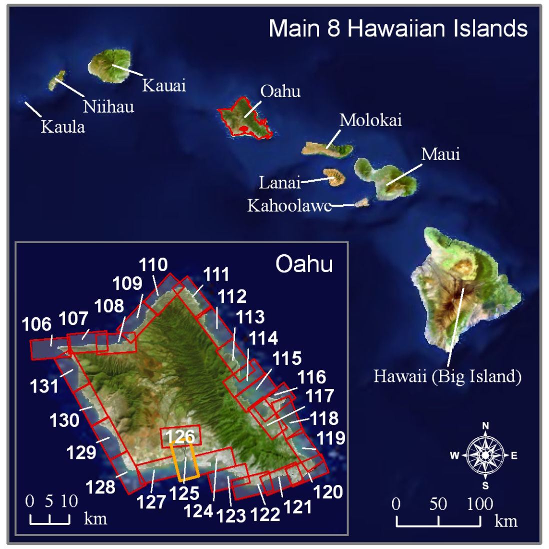
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 125)


21°18'N
157°57'W
Frame 126
21°18'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
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km
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Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- 🟦 Rock/Boulder
- 🟪 Rubble
- 🟪 Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

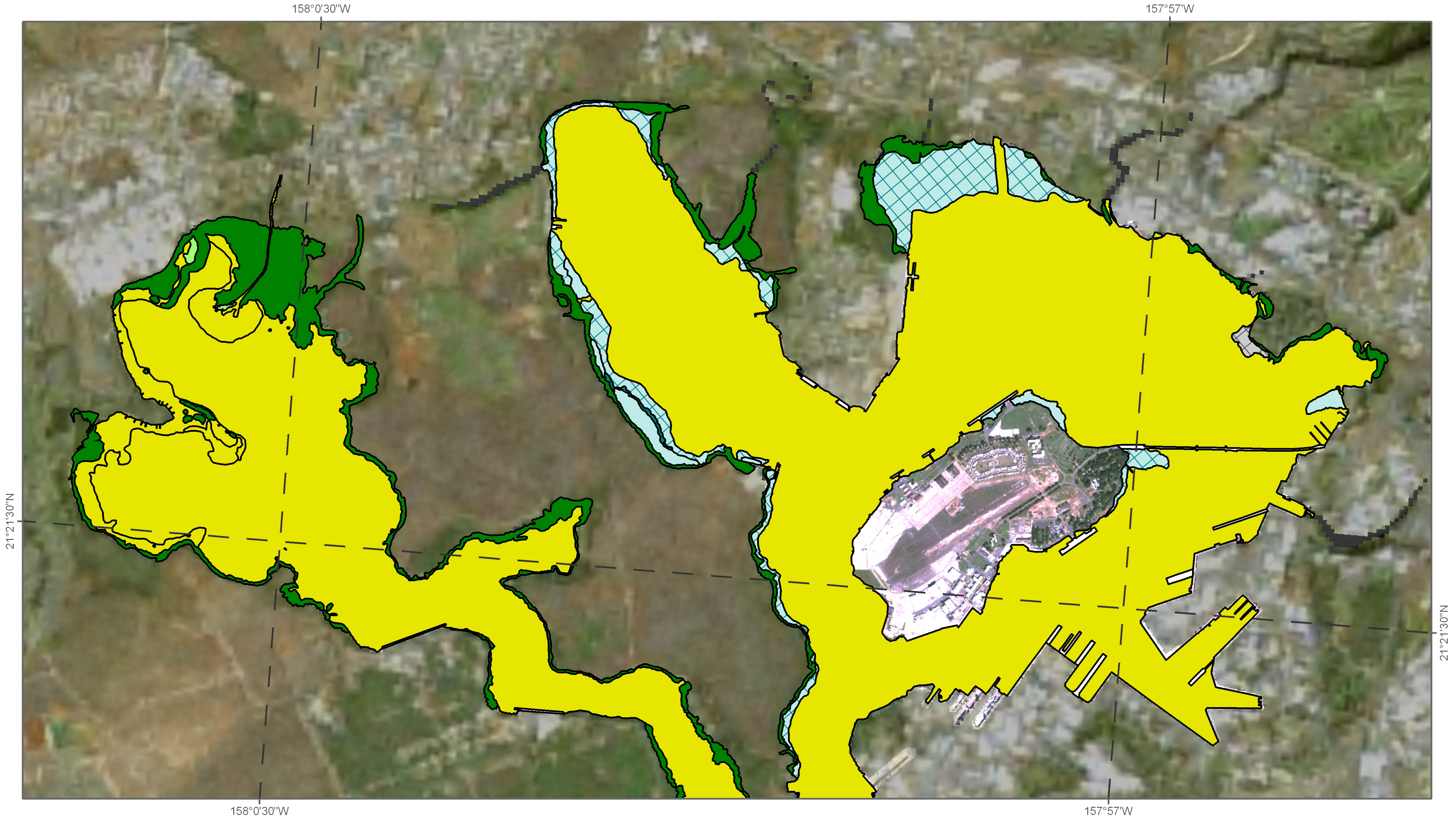
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 126)



158°0'30"W
157°57'W
21°21'30"N
21°21'30"N
158°0'30"W
157°57'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
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0 5 10
km
0 50 100
km
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

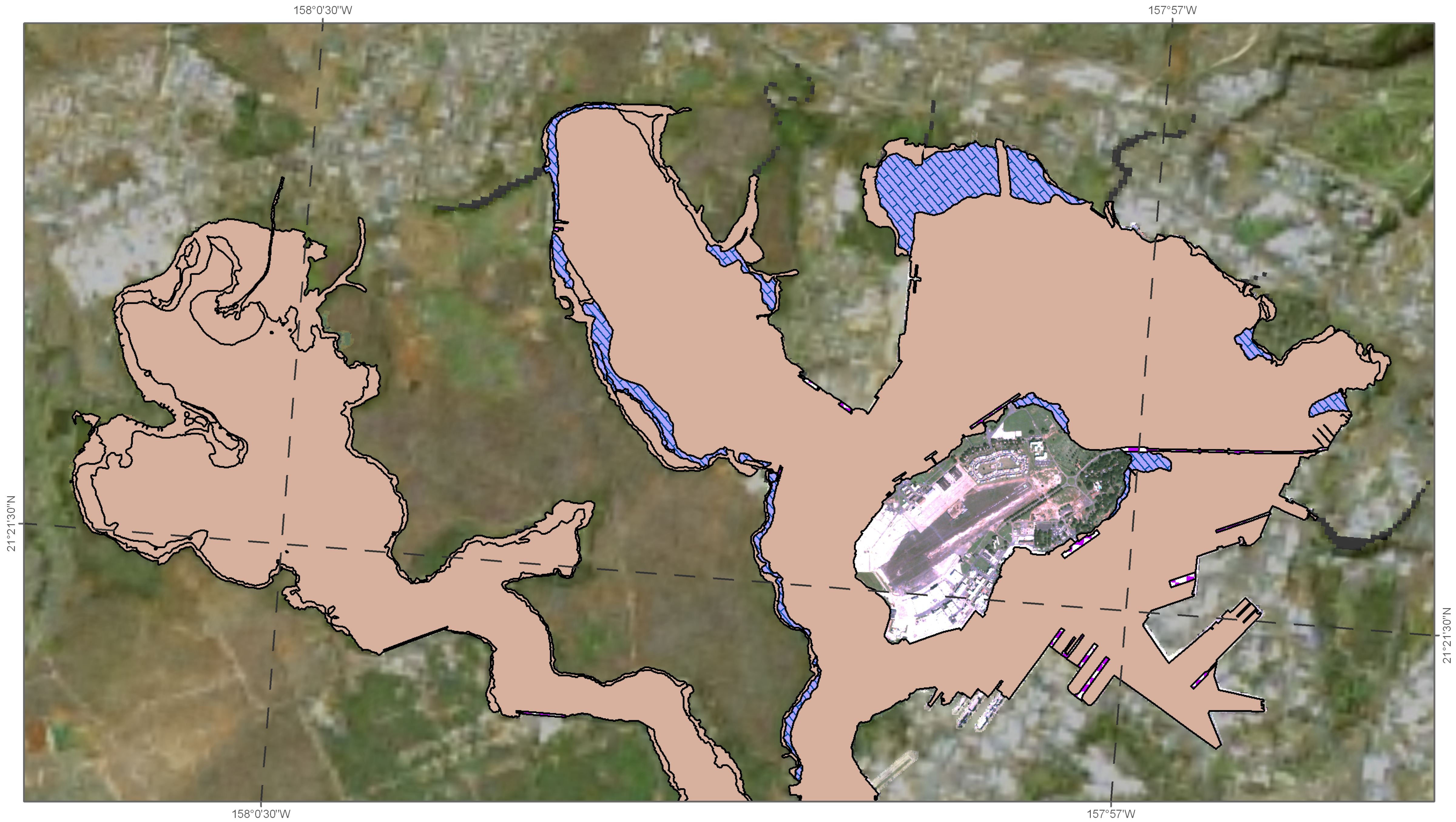
☐ Minimum Mapping Unit (1 Acre)

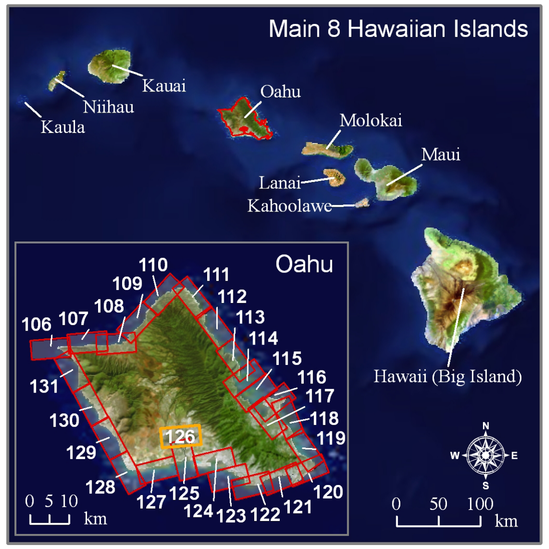
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 126)


158°0'30"W
157°57'W
21°21'30"N
21°21'30"N
158°0'30"W
157°57'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Oahu
106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131
0 5 10 km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- 🟪 Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

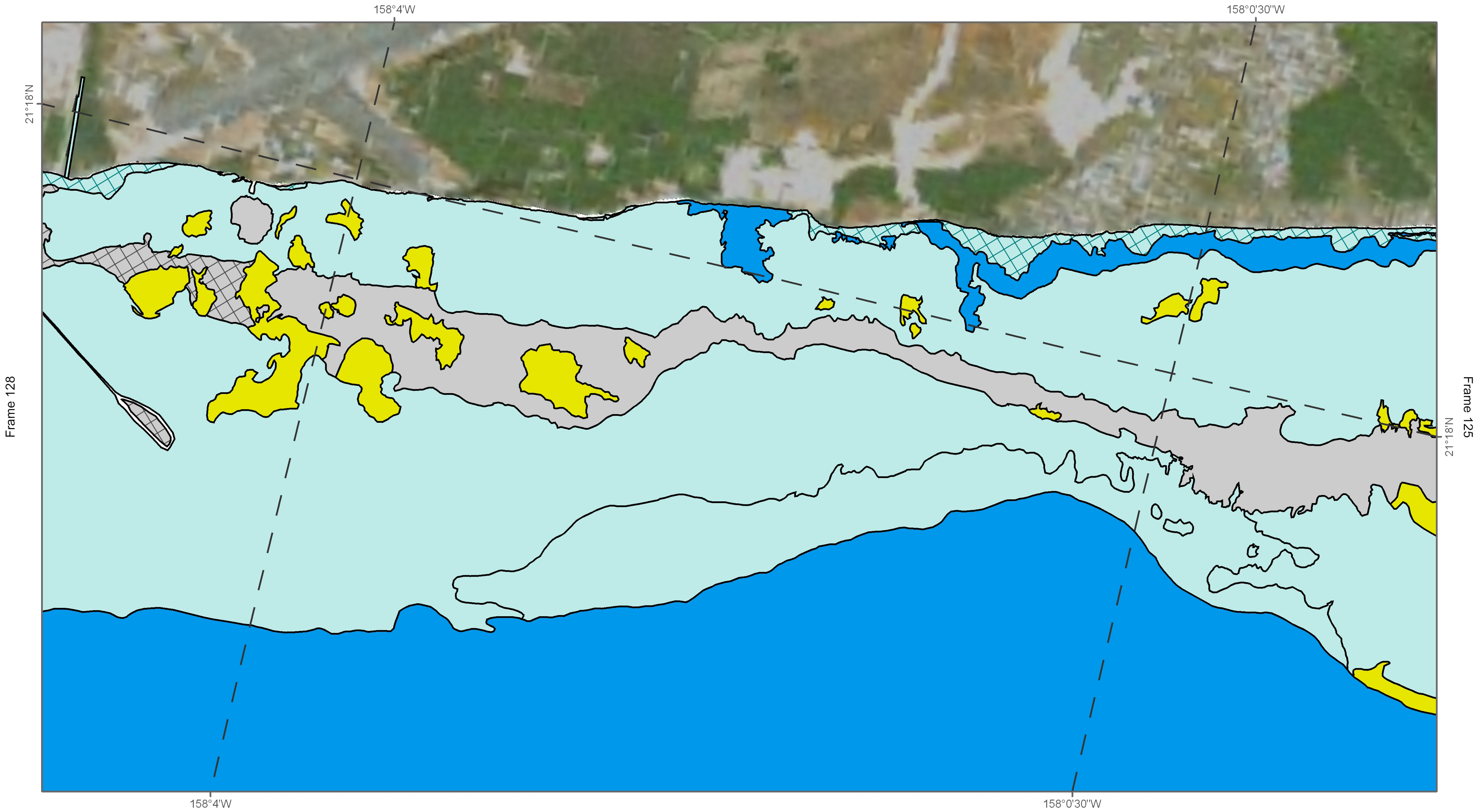
☐ Minimum Mapping Unit (1 Acre)

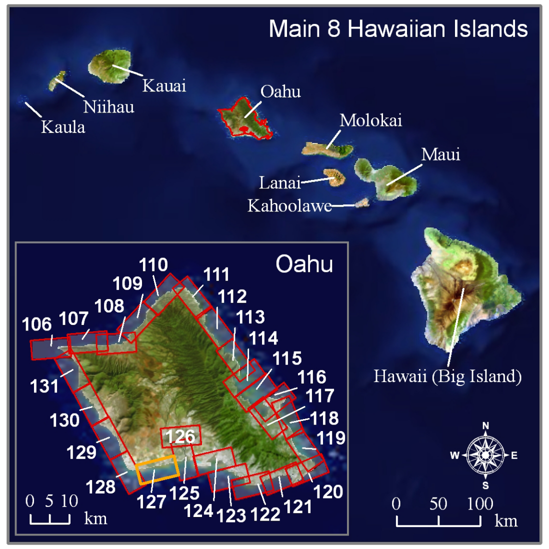
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 127)


158°4'W
158°0'30"W
21°18'N
Frame 128
Frame 125
21°18'N
158°4'W
158°0'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▢ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▢ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▢ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
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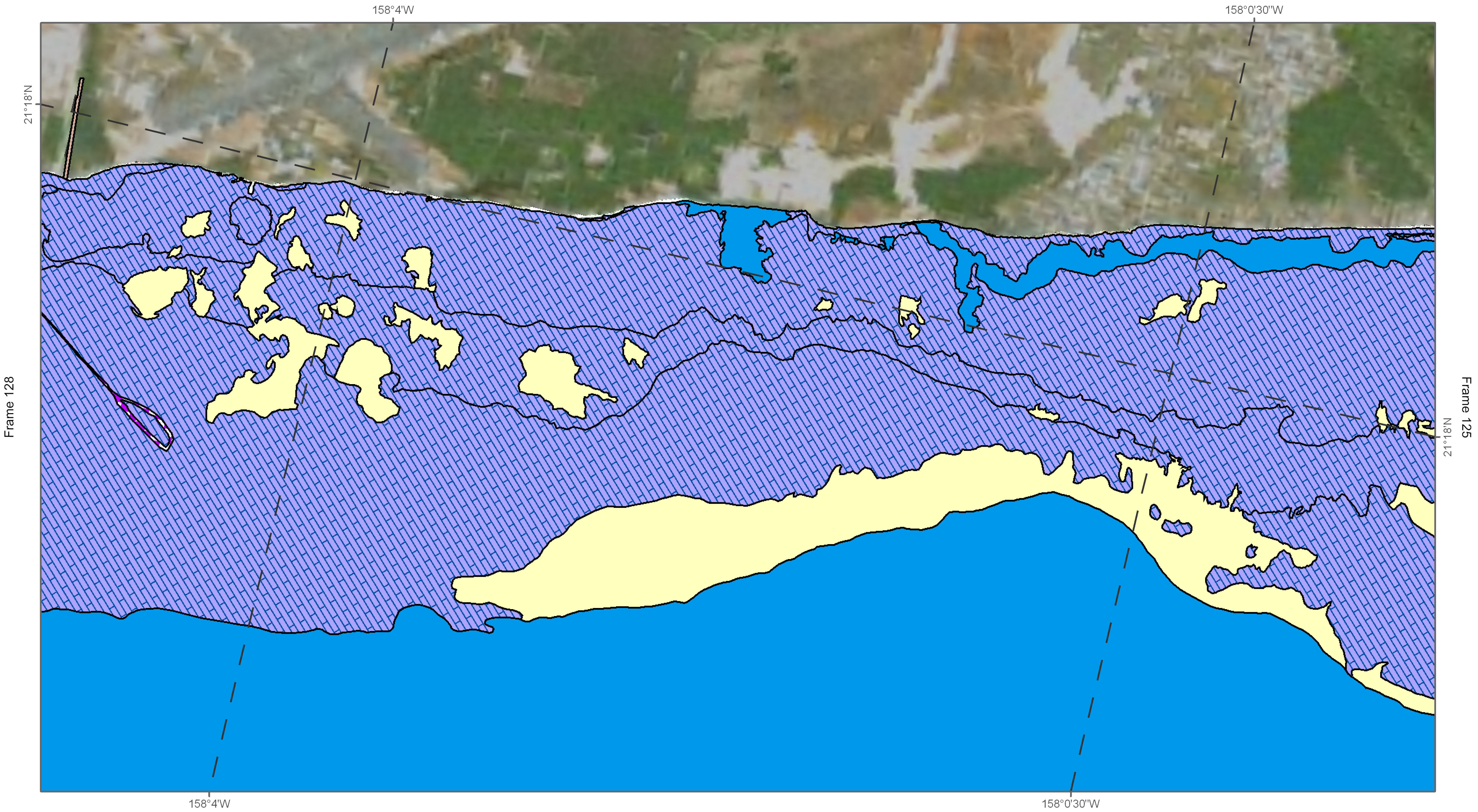
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 127)


158°4'W
158°0'30"W
21°18'N
Frame 128
Frame 125
21°18'N
158°4'W
158°0'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
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Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

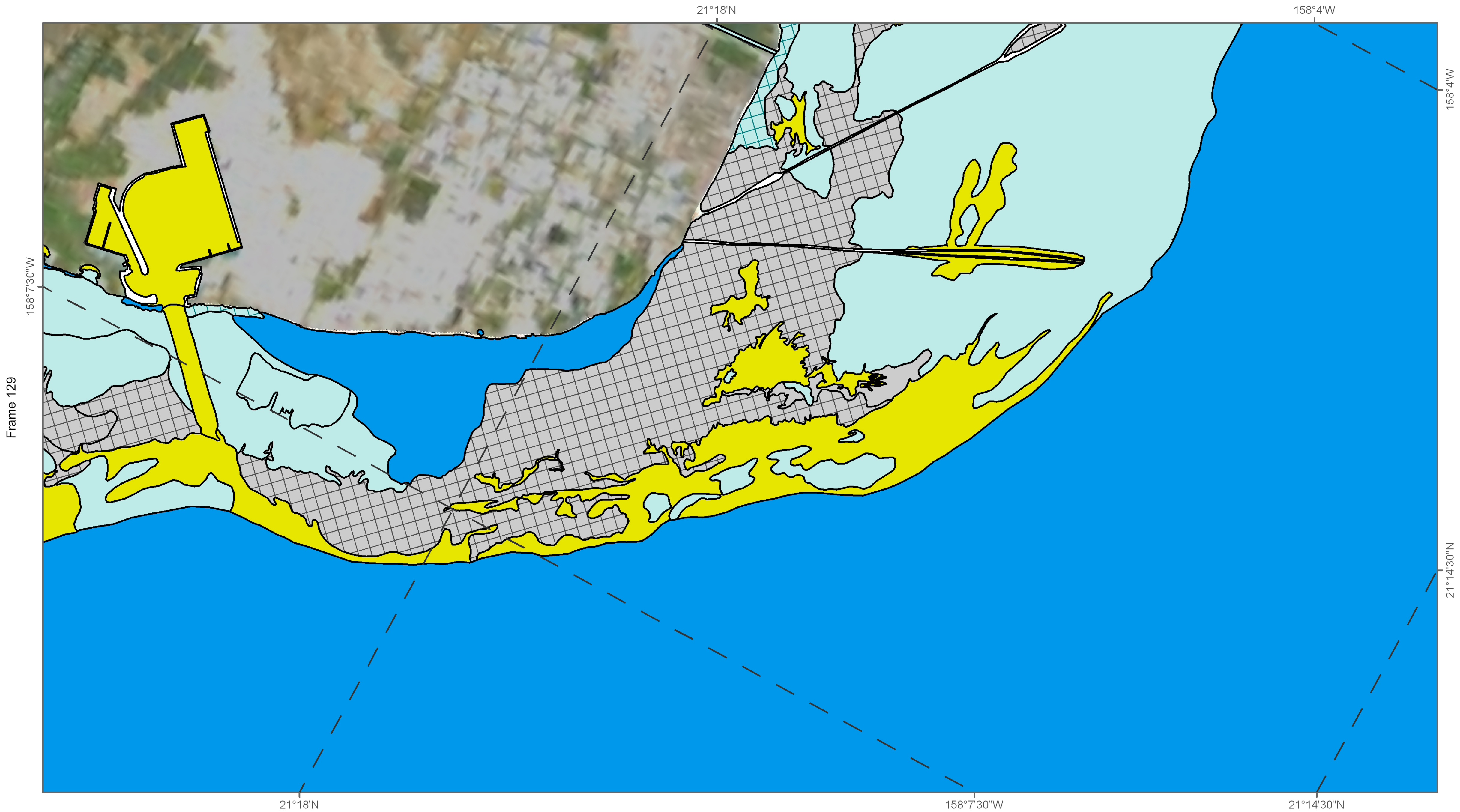
□ Minimum Mapping Unit (1 Acre)

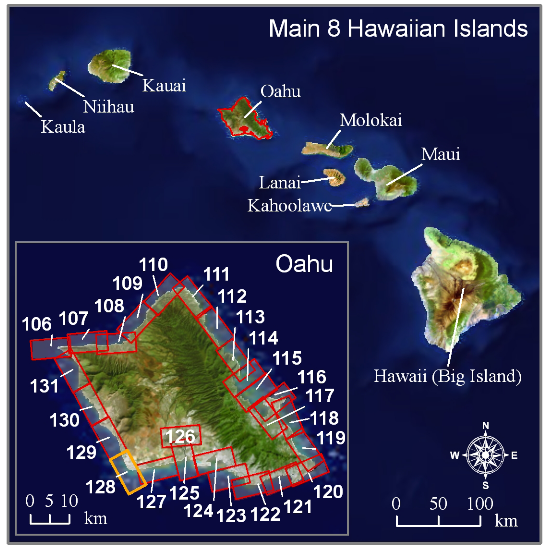
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 128)


21°18'N
158°4'W
158°4'W
158°7'30"W
Frame 129
21°14'30"N
21°18'N
158°7'30"W
21°14'30"N
0 0.5 1 1.5 km
1 0.5 0 mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
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0 5 10 km
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
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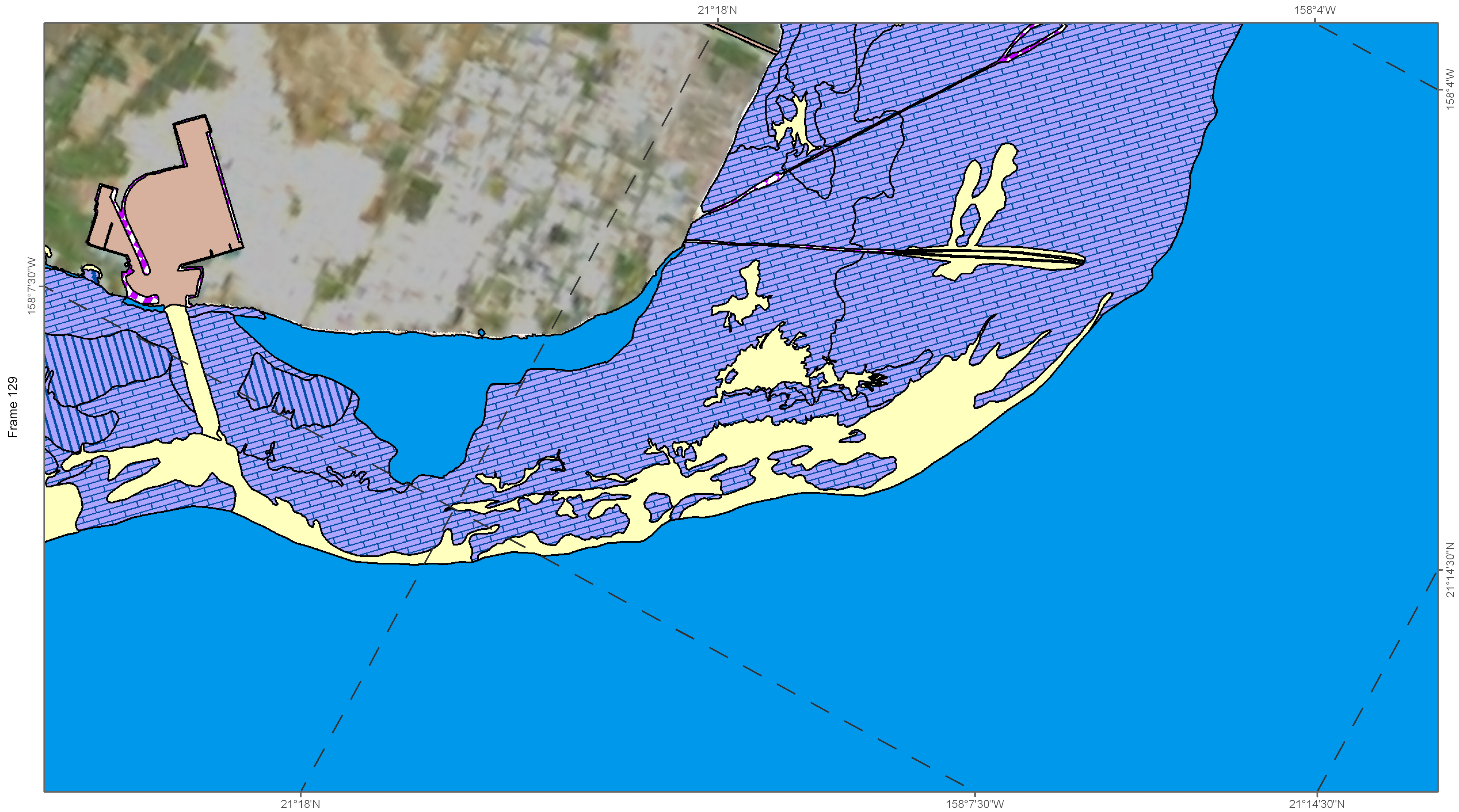
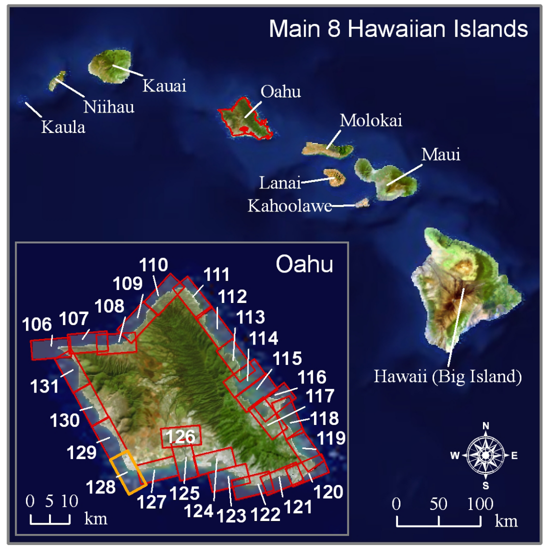
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 128)


21°18'N
158°4'W
158°4'W
158°7'30"W
Frame 129
21°14'30"N
21°18'N
158°7'30"W
21°14'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100
km
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0 5 10
km

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

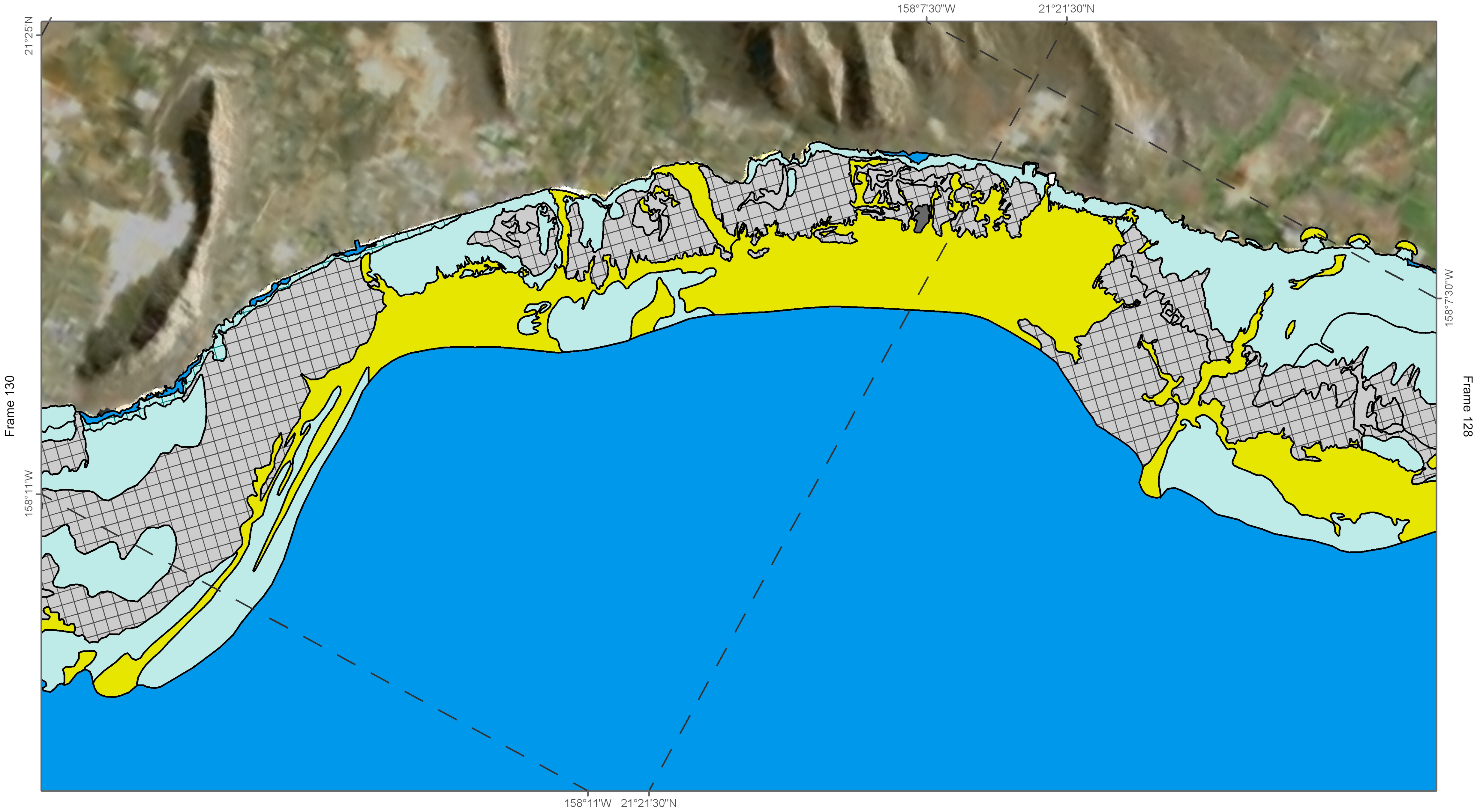
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 129)


158°7'30"W
21°21'30"N
21°25'N
158°11'W
158°7'30"W
Frame 130
Frame 128
158°11'W 21°21'30"N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131
0 5 10 km
0 50 100 km
N W E S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- ■ Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

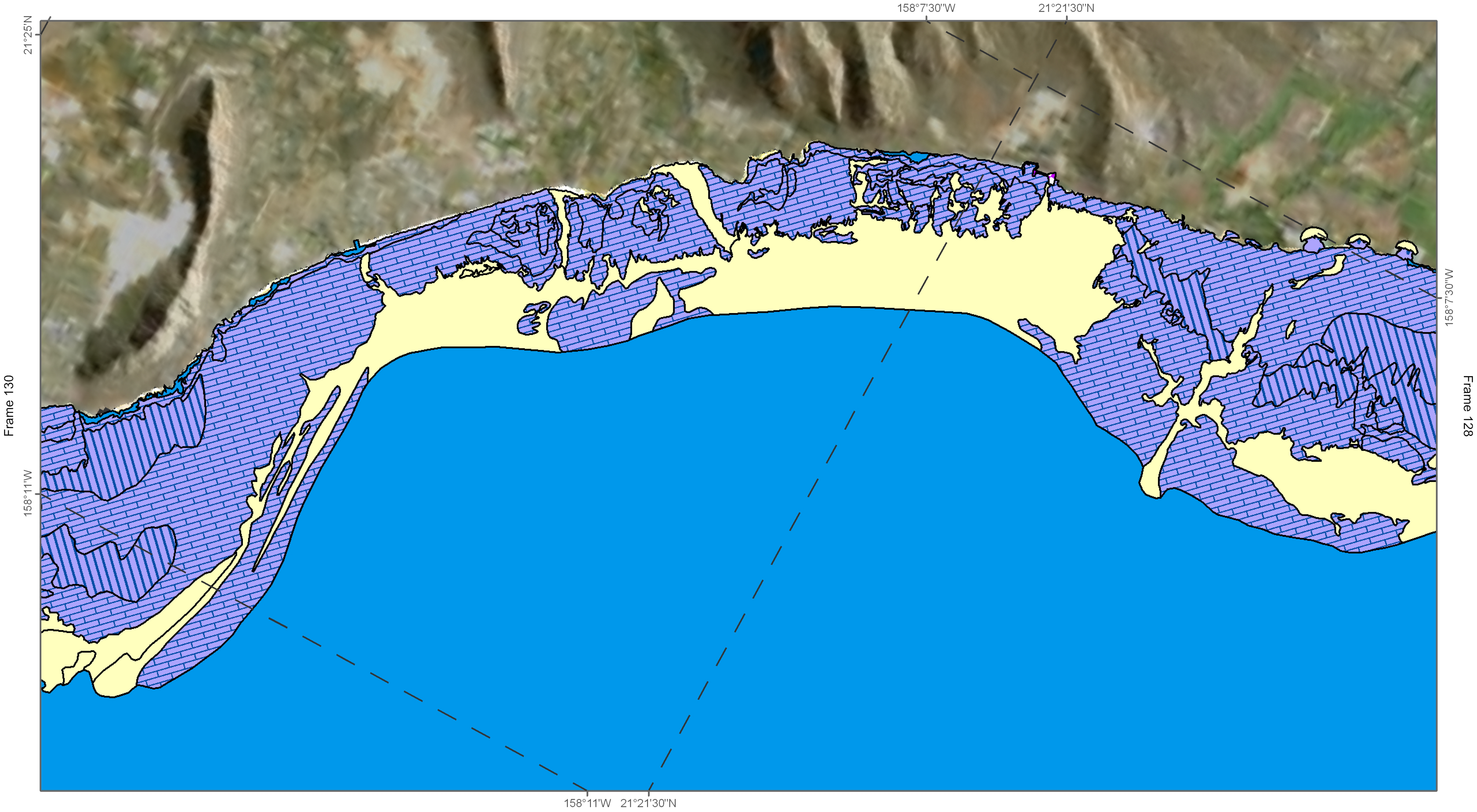
□ Minimum Mapping Unit (1 Acre)

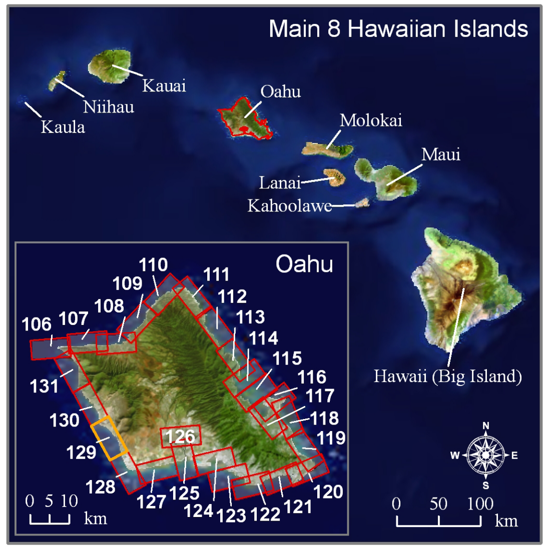
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 129)


158°7'30"W
21°21'30"N
21°25'N
Frame 130
158°11'W
158°7'30"W
Frame 128
158°11'W
21°21'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

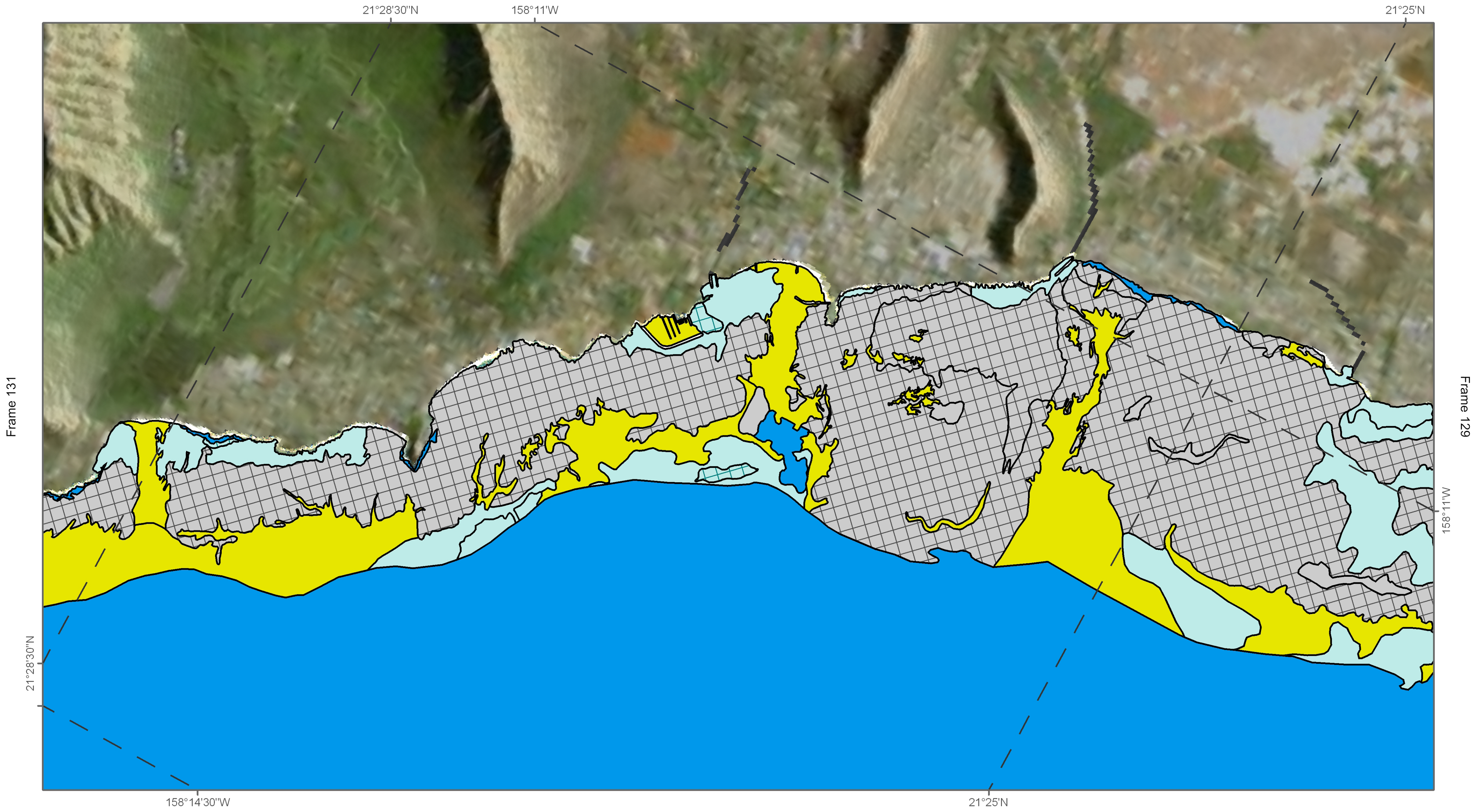
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 130)


21°28'30"N
158°11'W
21°25'N
Frame 131
Frame 129
21°28'30"N
158°11'W
158°14'30"W
21°25'N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Oahu
110
111
109
112
108
113
106
107
114
115
116
117
131
118
130
119
126
129
120
128
125
127
121
124
123
122
0 5 10 km

Biological Cover Types

- ■ Coral 10%-<50%
- ▨ Coral 50%-<90%
- ■ Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- ■ Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- ■ Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- ■ Uncolonized 90%-100%
- □ Unclassified
- ■ Unknown

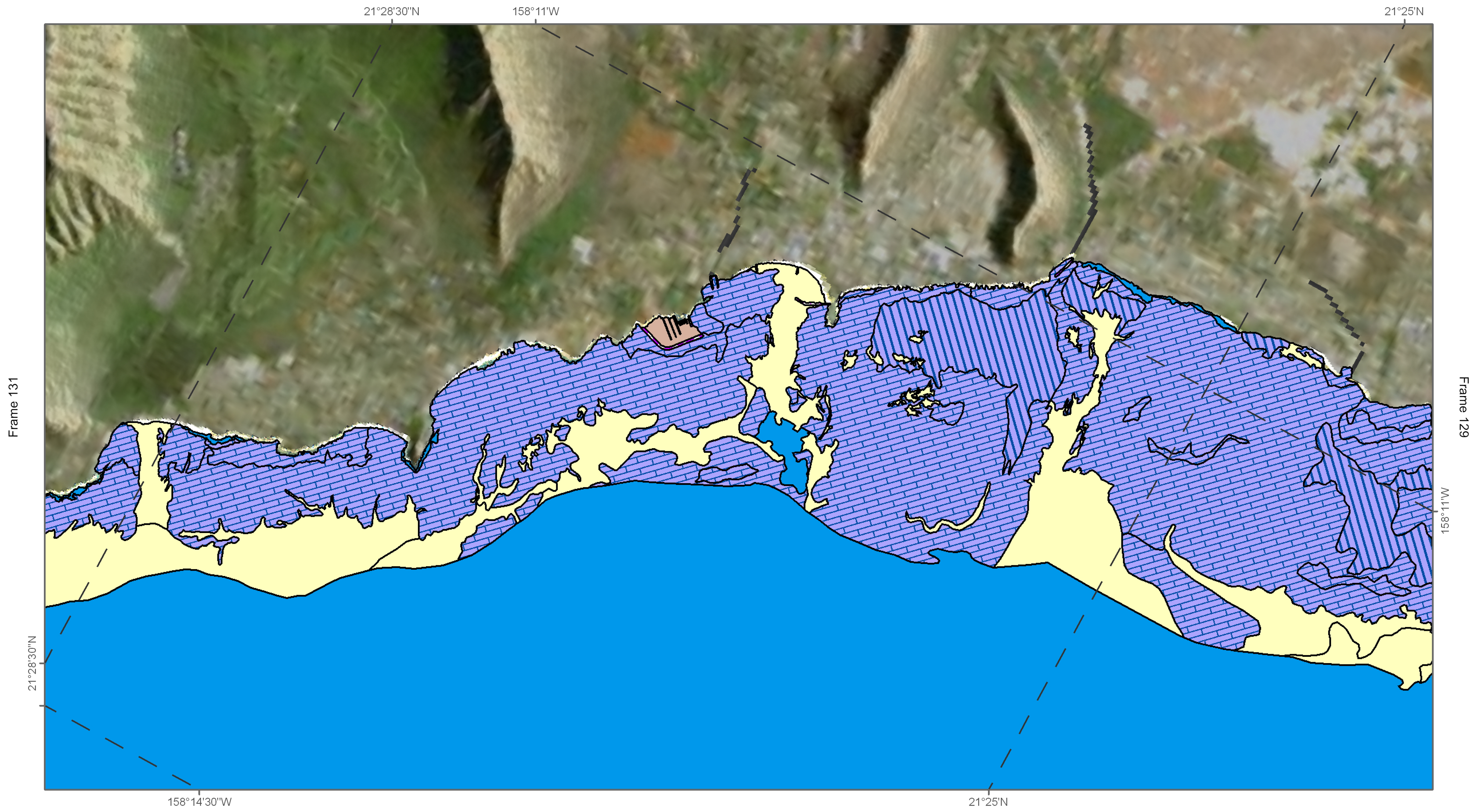
□ Minimum Mapping Unit (1 Acre)

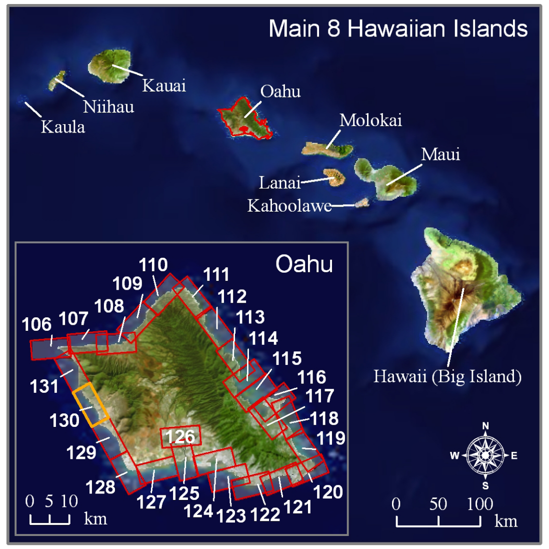
0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 130)


21°28'30"N
158°11'W
21°25'N
Frame 131
Frame 129
158°11'W
21°28'30"N
158°14'30"W
21°25'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
110
111
109
112
108
113
106
107
114
115
116
131
117
118
130
119
126
129
128
120
127
125
121
124
123
122
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

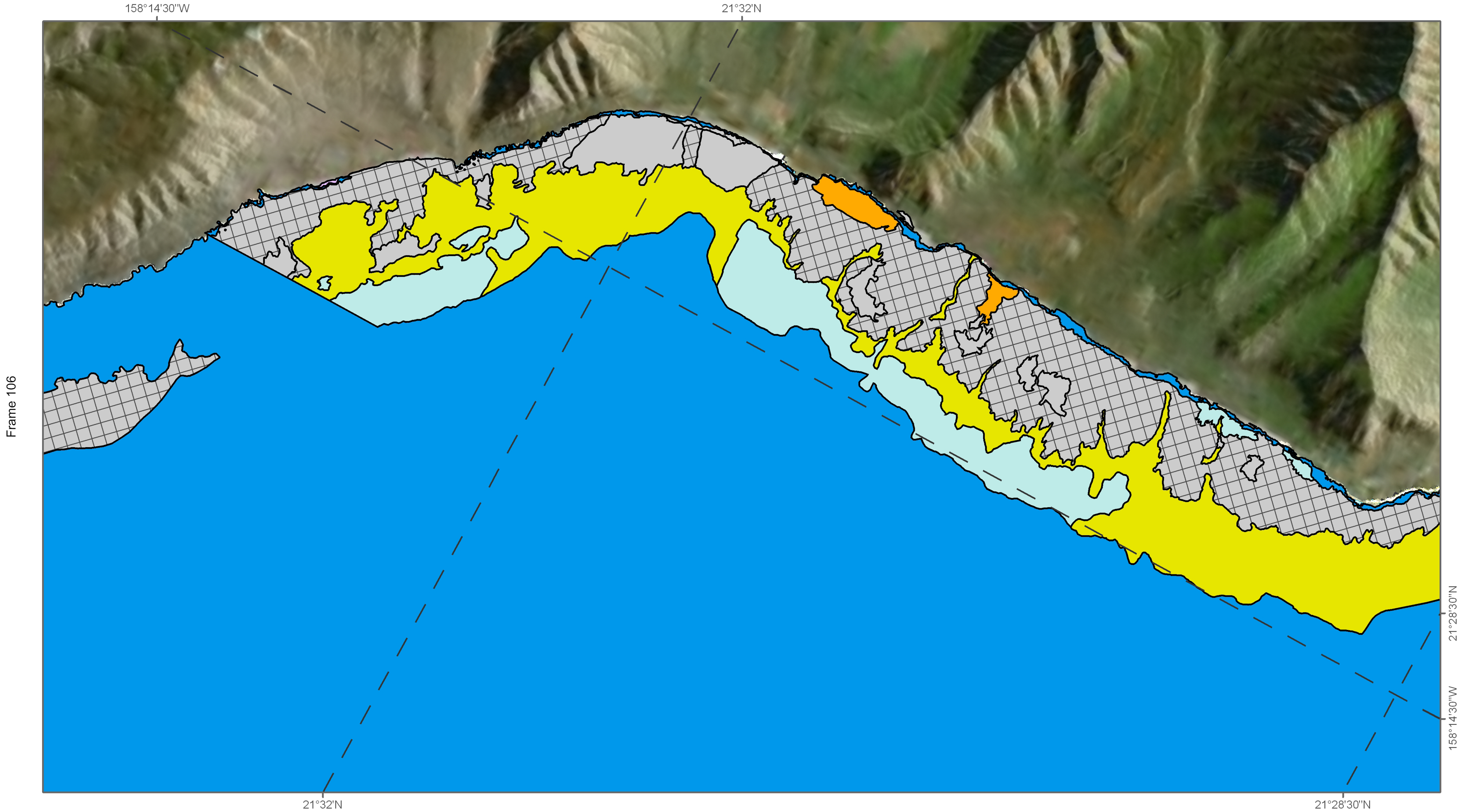
☐ Minimum Mapping Unit (1 Acre)

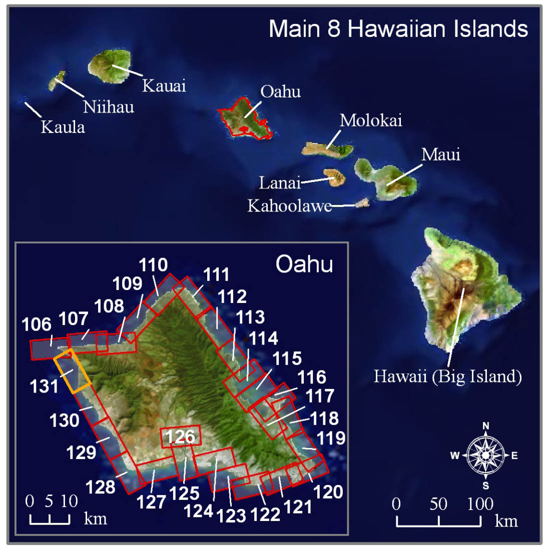
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 131)


158°14'30"W
21°32'N
Frame 106
Frame 130
21°28'30"N
158°14'30"W
21°32'N
21°28'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Oahu
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
0 5 10 km
0 50 100 km
N
E
S
W

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

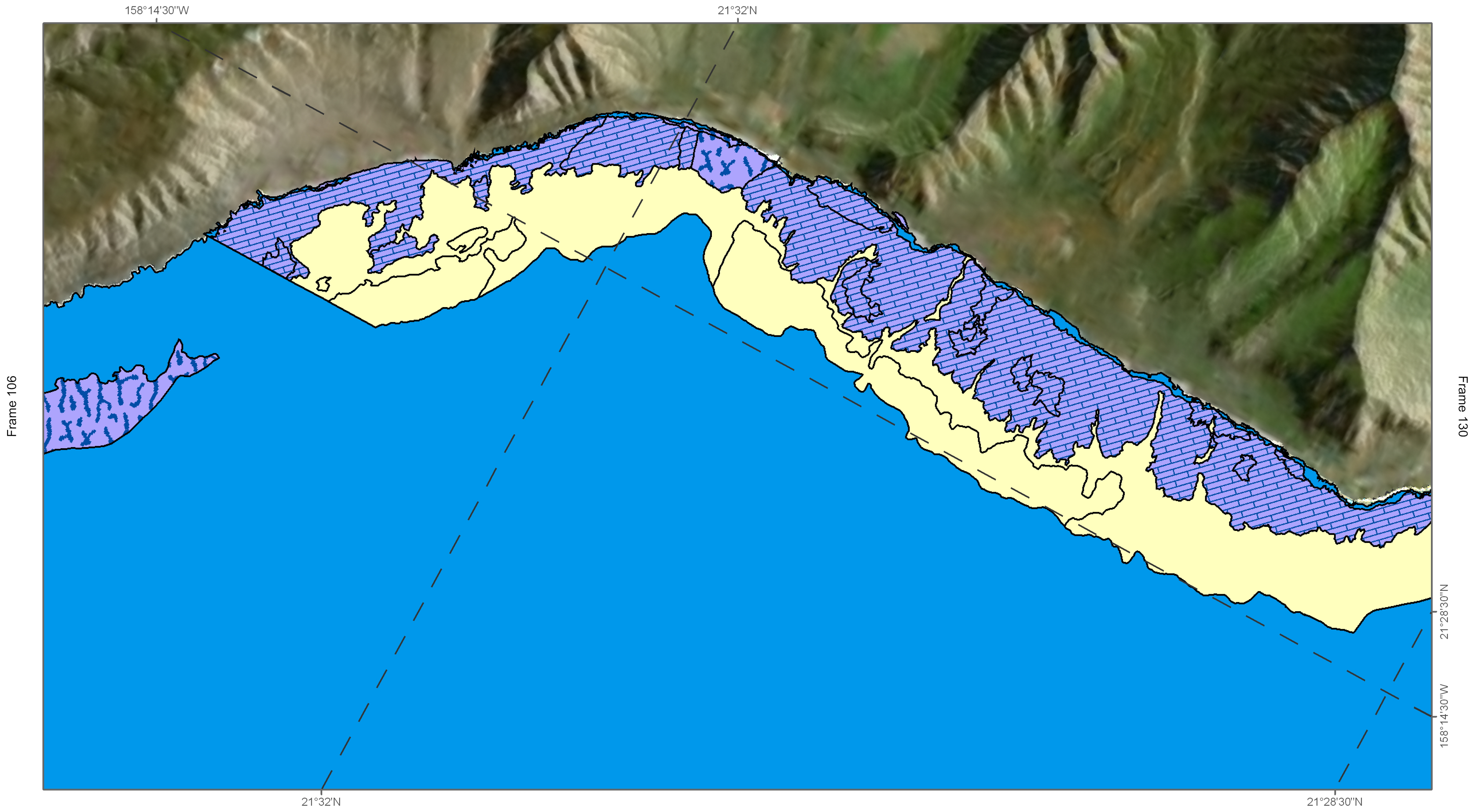
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Oahu) : Shallow-water Benthic Habitats (Frame 131)


158°14'30"W
21°32'N
Frame 106
Frame 130
21°28'30"N
158°14'30"W
21°32'N
21°28'30"N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100
km
Oahu
110
111
109
112
108
113
106
107
114
115
116
131
117
118
130
126
119
129
128
120
127
125
121
124
123
122
0 5 10
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟨 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- 🟪 Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

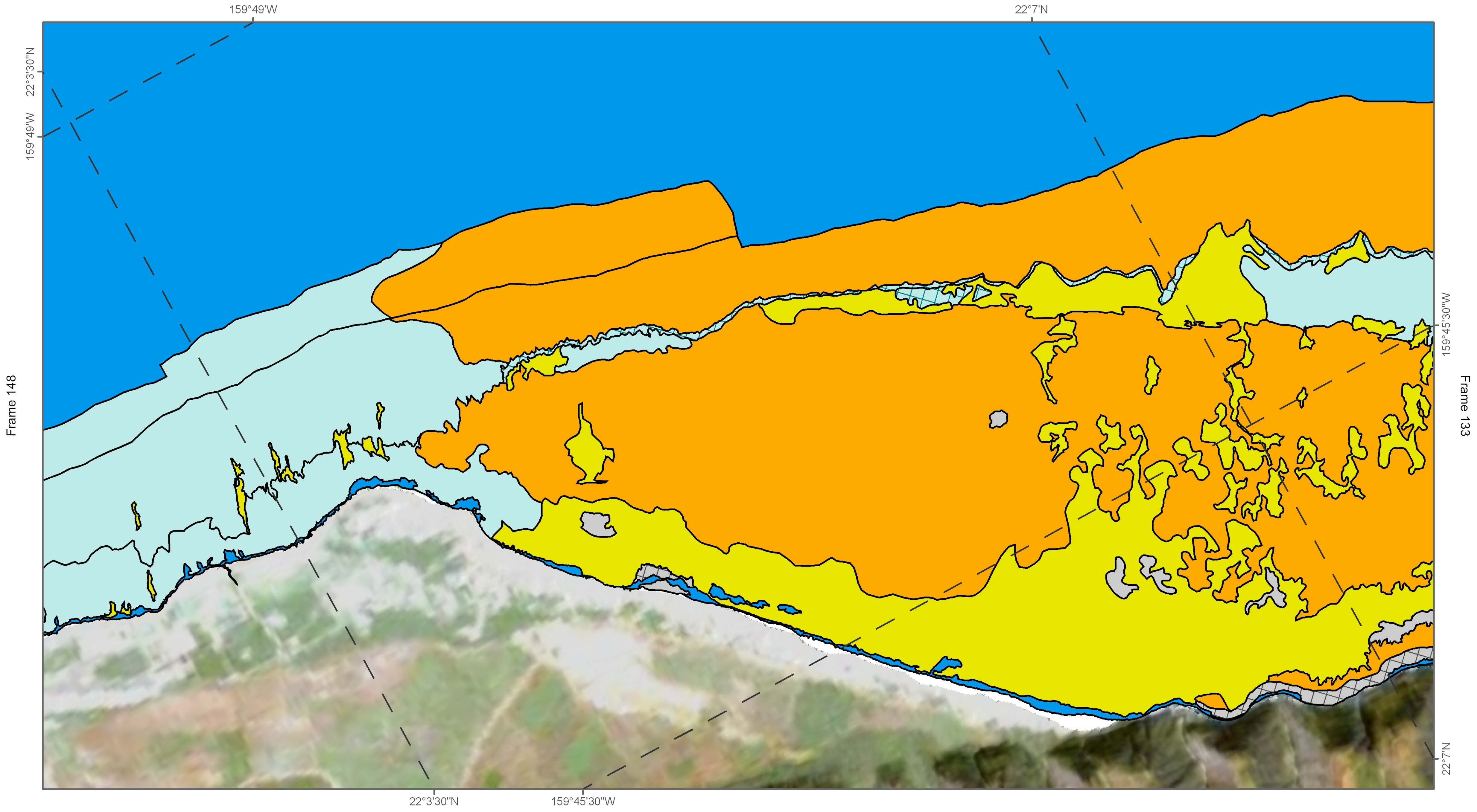
□ Minimum Mapping Unit (1 Acre)

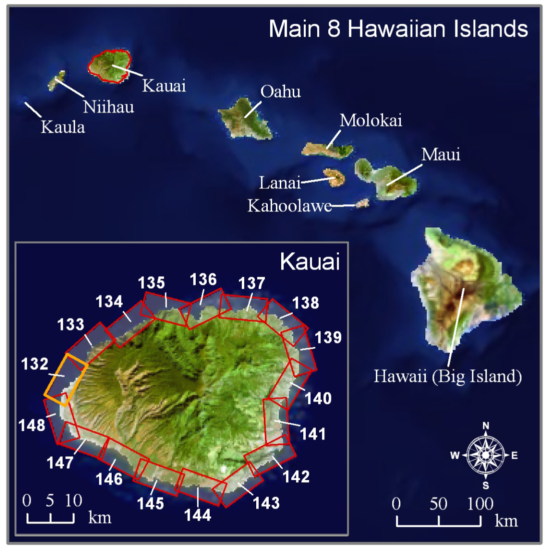
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 132)


159°49'W
22°7'N
22°3'30"N
159°49'W
Frame 148
159°45'30"W
Frame 133
22°7'N
22°3'30"N
159°45'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
0 5 10 km
0 50 100 km
N
W
E
S

Biological Cover Types

🟧 Coral 10%-<50%
▨ Coral 50%-<90%
🟥 Coral 90%-100%
▨ Seagrass 10%-<50%
■ Macroalgae 10%-<50%
▨ Macroalgae 50%-<90%
■ Macroalgae 90%-100%
■ Coralline Algae 10%-<50%
▨ Coralline Algae 50%-<90%
■ Turf 10%-<50%
▨ Turf 50%-<90%
■ Turf 90%-100%
■ Emergent Vegetation 10%-<50%
▨ Emergent Vegetation 50%-<90%
■ Emergent Vegetation 90%-100%
■ Uncolonized 50%-<90%
🟨 Uncolonized 90%-100%
☐ Unclassified
🟦 Unknown

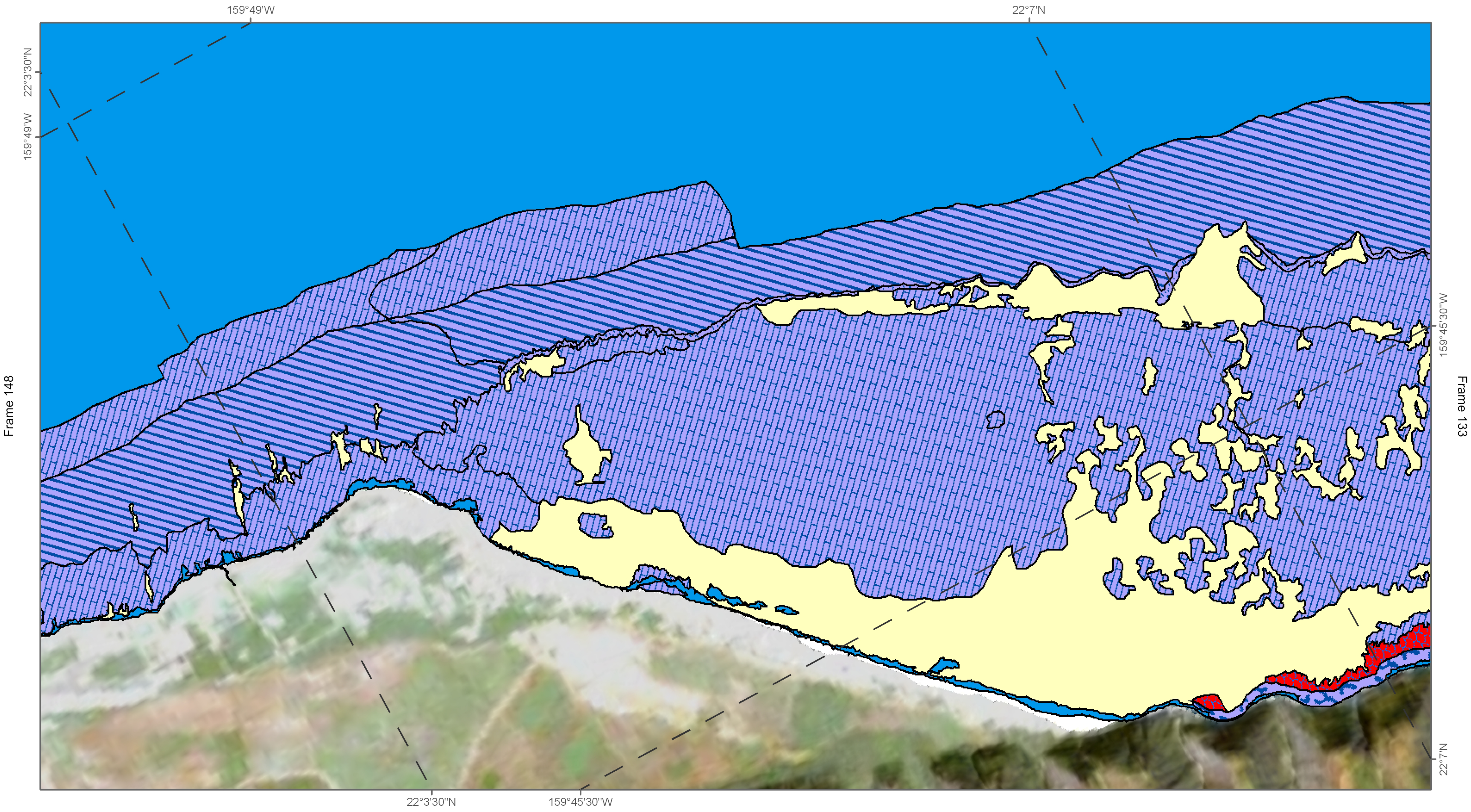
☐ Minimum Mapping Unit (1 Acre)

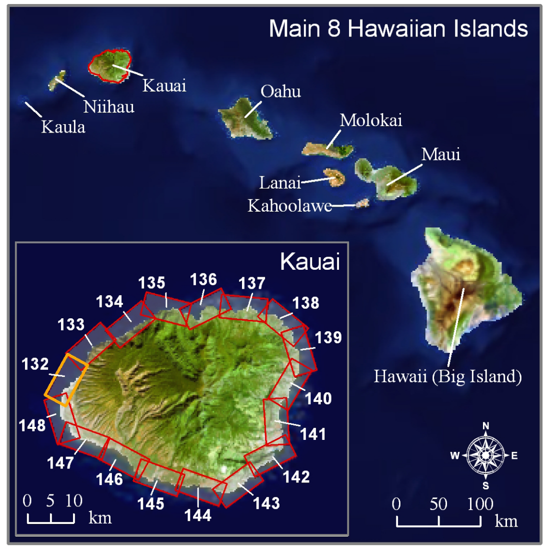
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 132)


159°49'W
22°7'N
22°3'30"N
159°49'W
Frame 148
159°45'30"W
Frame 133
22°7'N
22°3'30"N
159°45'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

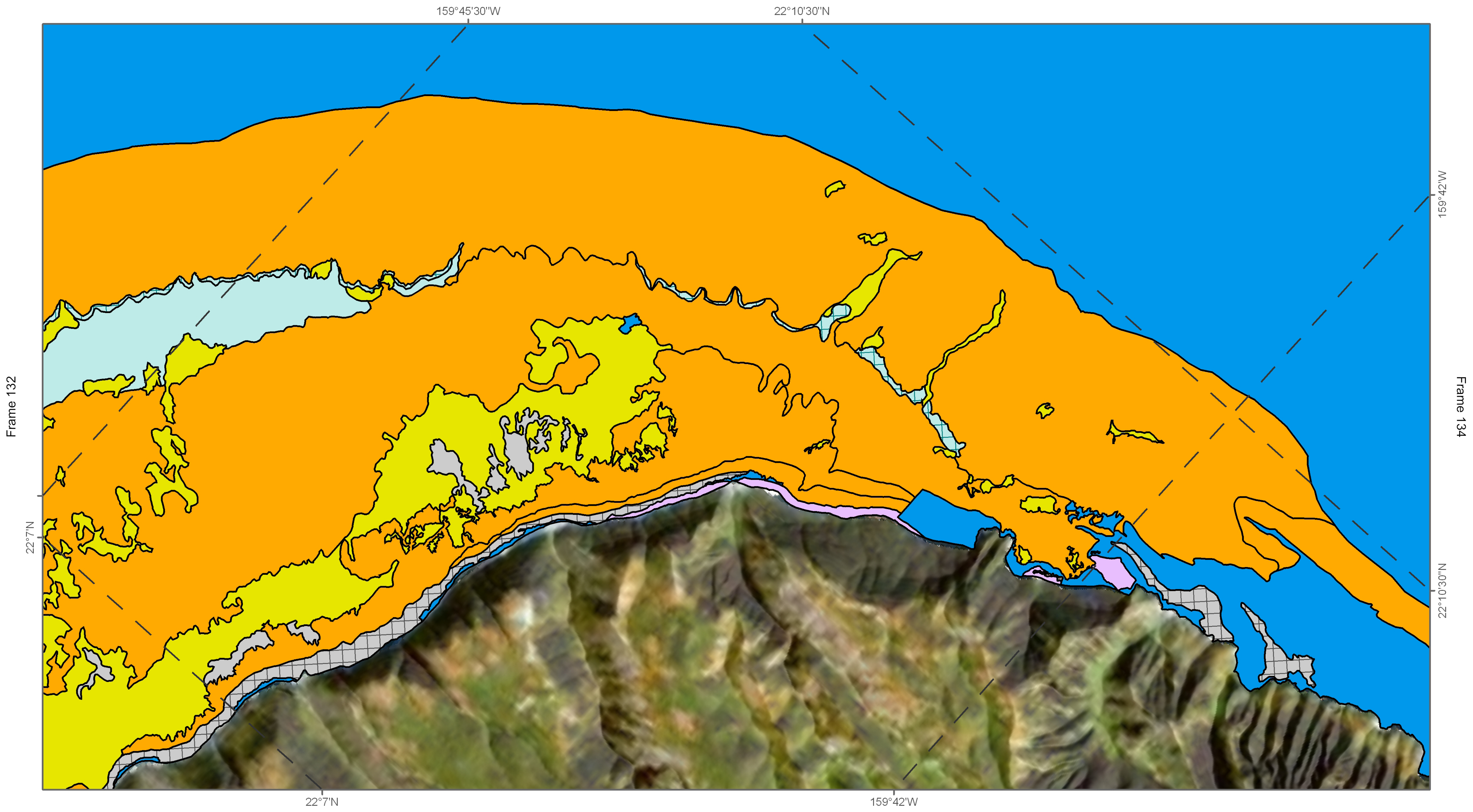
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 133)


159°45'30"W
22°10'30"N
159°42'W
22°10'30"N
Frame 132
Frame 134
22°7'N
22°7'N
159°42'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
0 5 10
km
0 50 100
km
N
E
S
W

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▨ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ▨ Macroalgae 90%-100%
- ▨ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

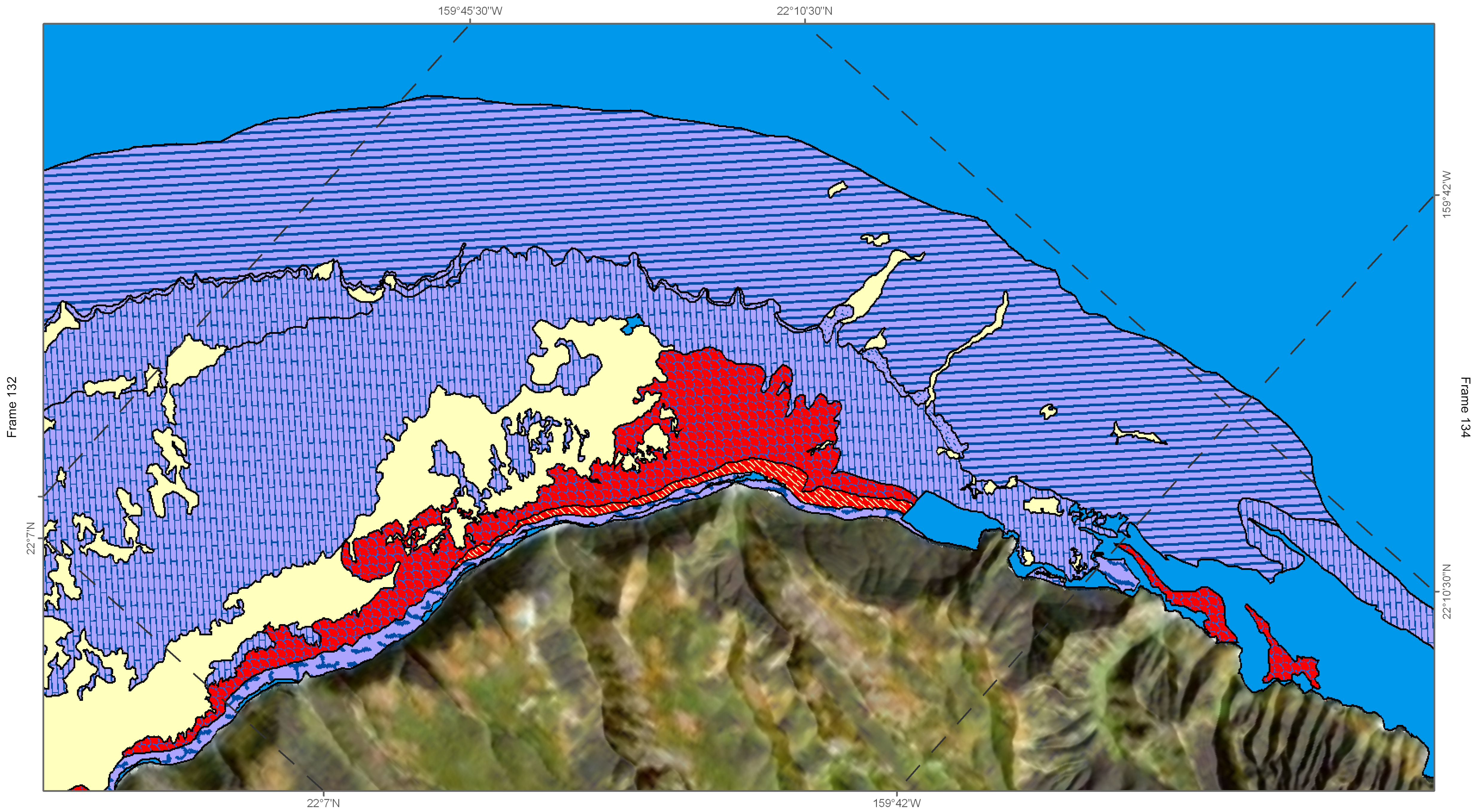
☐ Minimum Mapping Unit (1 Acre)

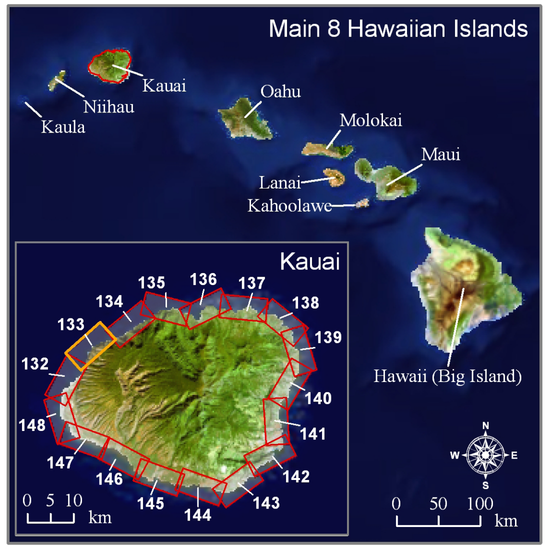
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 133)


159°45'30"W
22°10'30"N
159°42'W
22°10'30"N
22°7'N
22°7'N
159°42'W
Frame 132
Frame 134


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

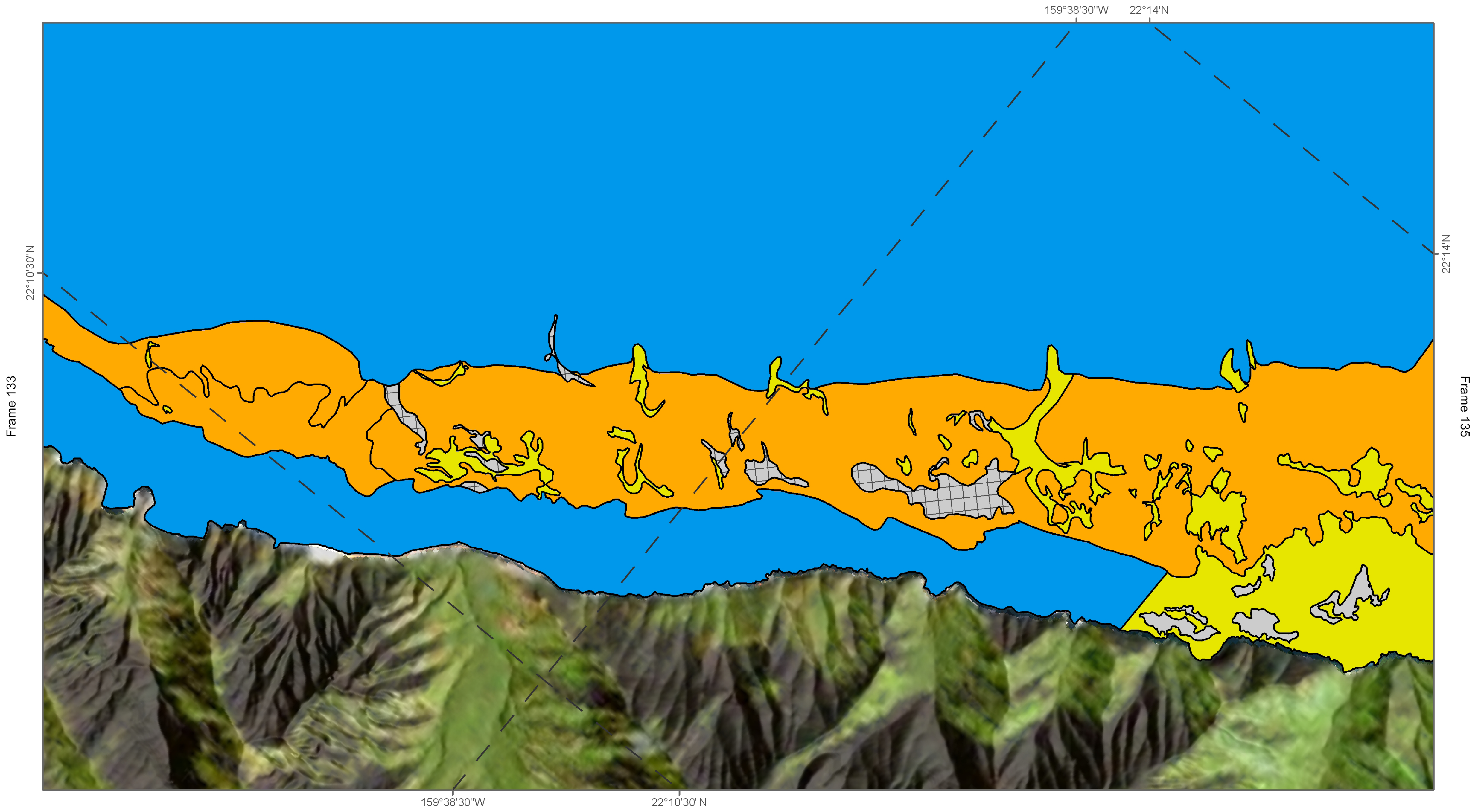
□ Minimum Mapping Unit (1 Acre)

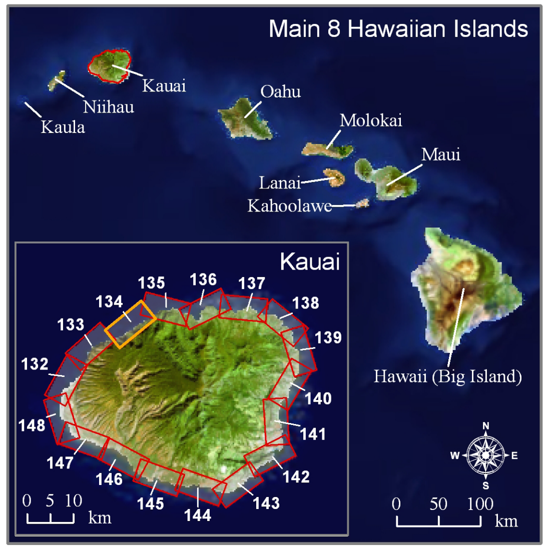
0 0.5 1 1.5 km

mi 1 0.5 0

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 134)


159°38'30"W
22°14'N
22°10'30"N
22°14'N
Frame 133
Frame 135
159°38'30"W
22°10'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
132
0 5 10
km
0 50 100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- ▭ Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

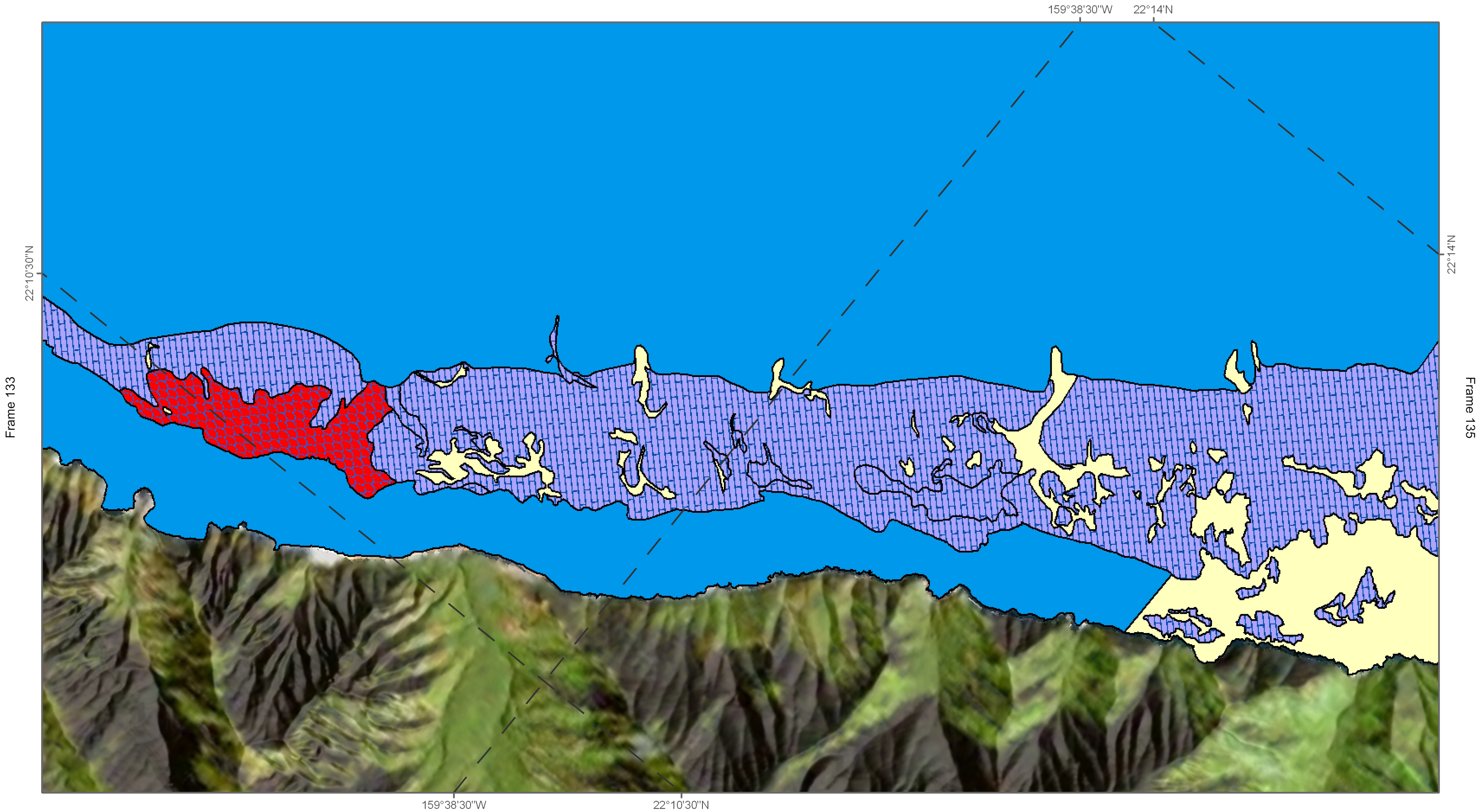
□ Minimum Mapping Unit (1 Acre)

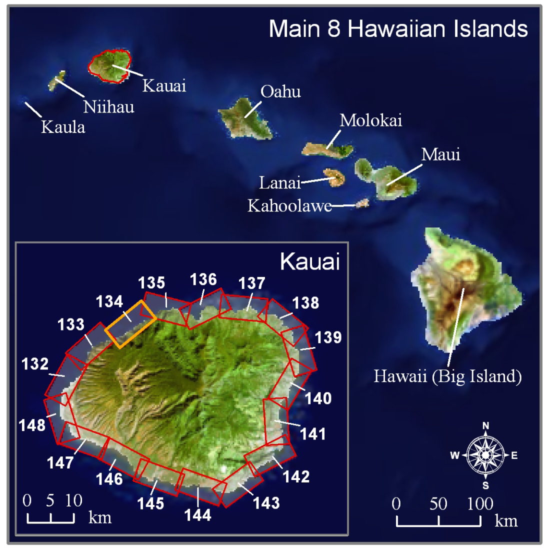
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 134)


159°38'30"W
22°14'N
22°10'30"N
Frame 133
22°14'N
Frame 135
159°38'30"W
22°10'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Kauai
135
136
137
134
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133
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132
140
148
141
147
146
142
145
144
143
0 5 10
km
Hawaii (Big Island)
N
W
E
S
0 50 100
km

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

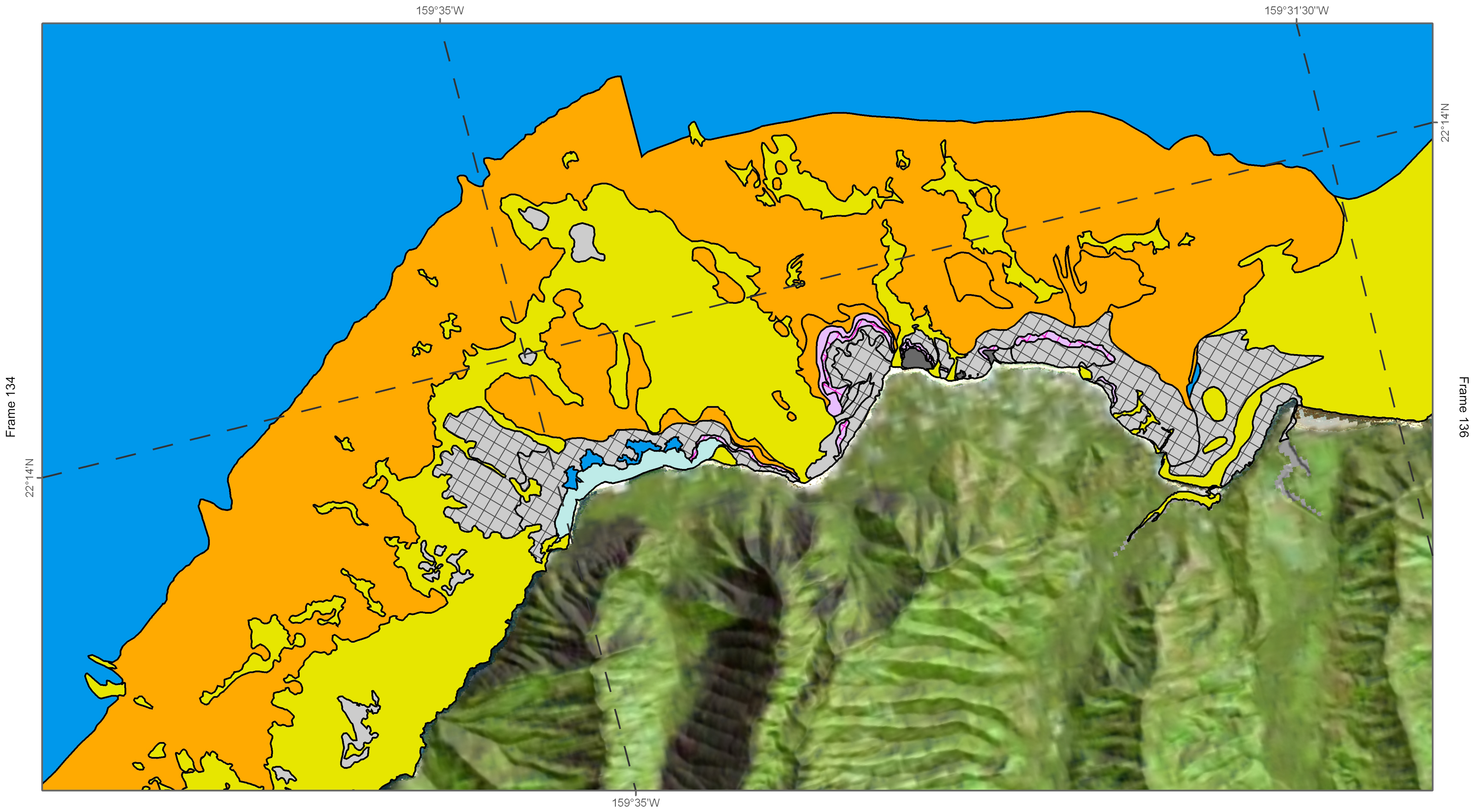
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 135)


159°35'W
159°31'30"W
22°14'N
22°14'N
Frame 134
Frame 136
159°35'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
0 5 10
km
0 50 100
km
N
S
E
W

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

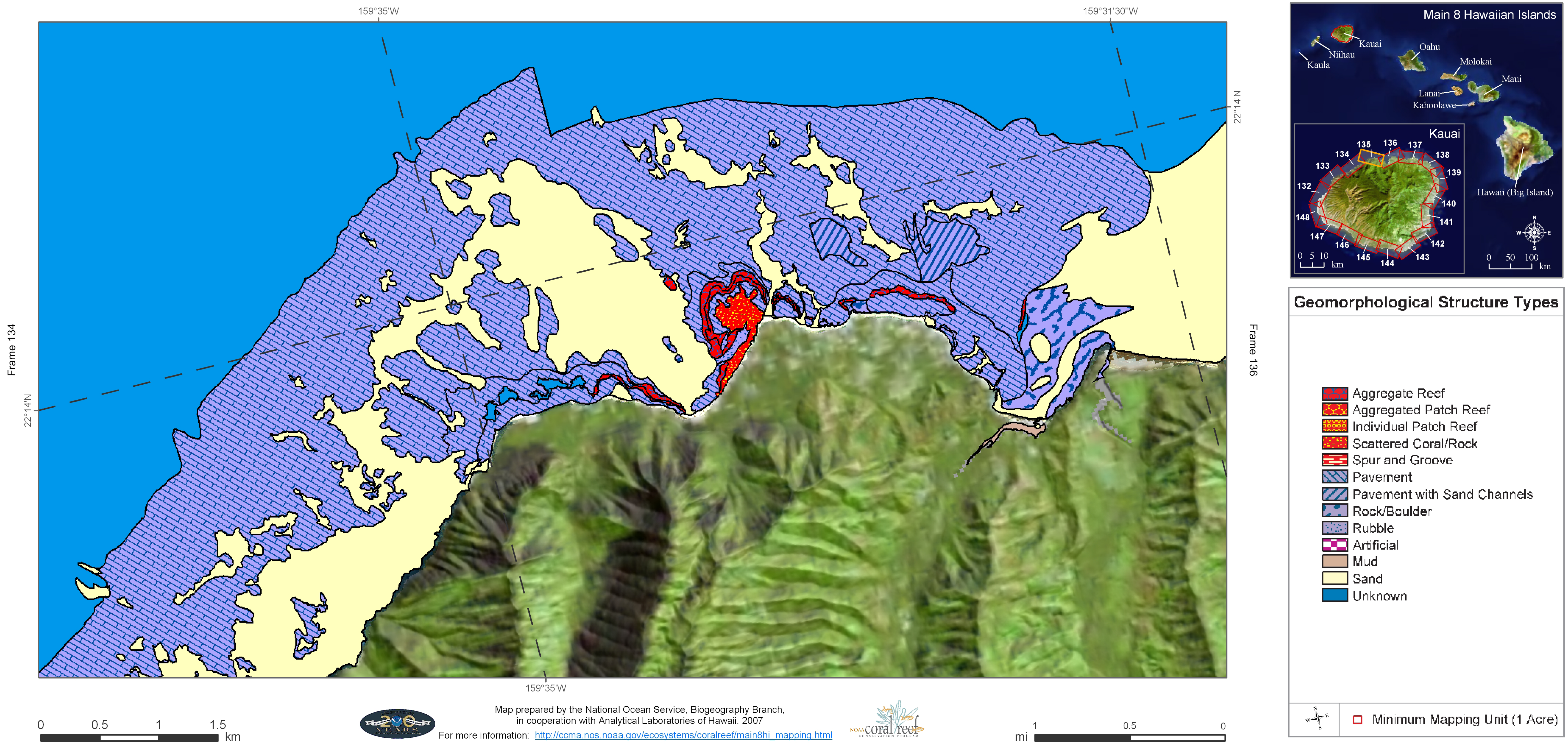
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

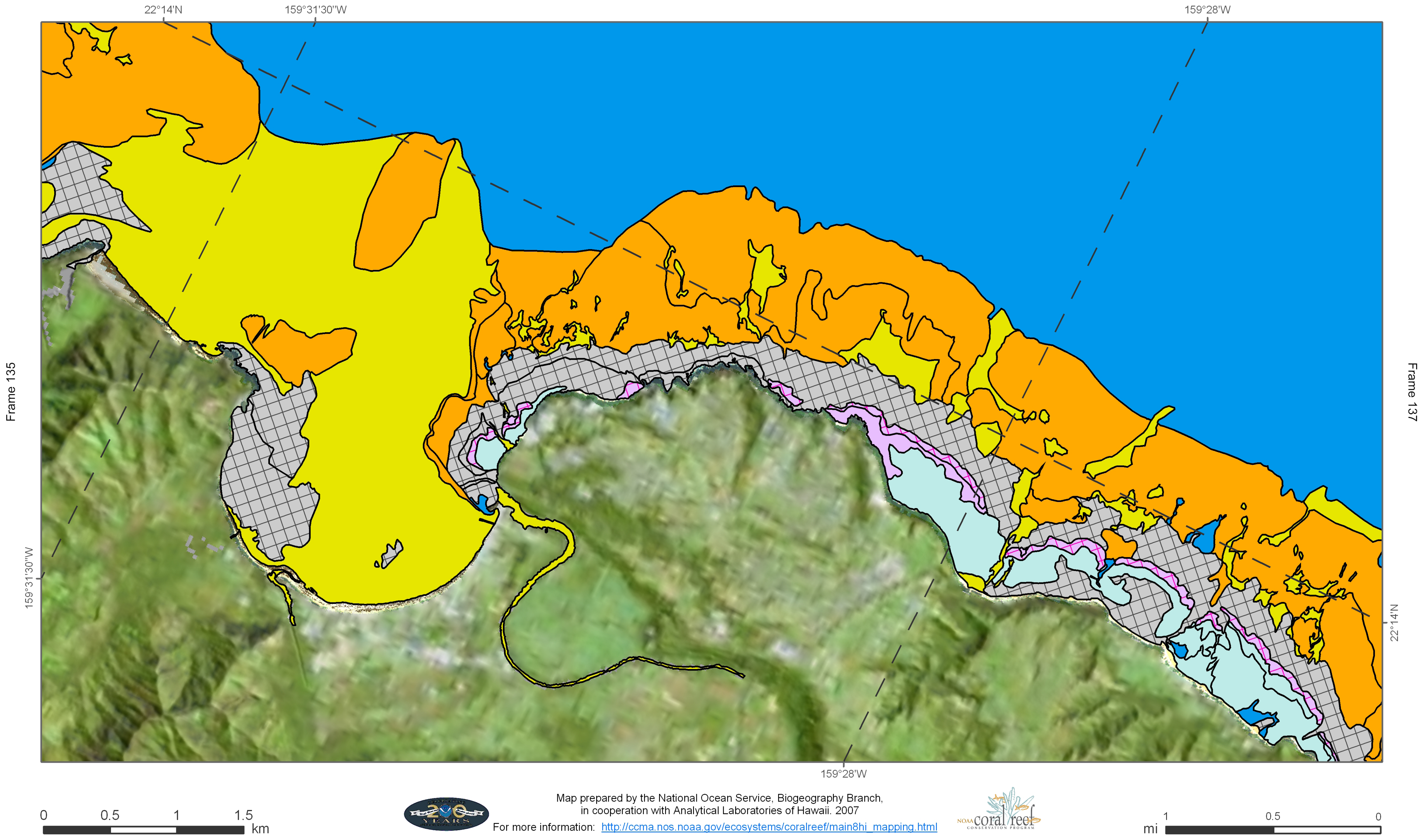
mi 1 0.5 0

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 135)


159°35'W
159°31'30"W
22°14'N
22°14'N
Frame 134
Frame 136
159°35'W
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
135
136
137
134
138
133
139
132
140
148
141
147
146
142
145
144
143
0 5 10 km
0 50 100 km
N
W
E
S
Geomorphological Structure Types
🟥 Aggregate Reef
🟥 Aggregated Patch Reef
🟥 Individual Patch Reef
🟥 Scattered Coral/Rock
🟥 Spur and Groove
▨ Pavement
▨ Pavement with Sand Channels
▨ Rock/Boulder
▨ Rubble
▨ Artificial
▨ Mud
▨ Sand
🟦 Unknown
☐ Minimum Mapping Unit (1 Acre)
0 0.5 1 1.5 km
mi 1 0.5 0

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 136)


22°14'N
159°31'30"W
159°28'W
Frame 135
Frame 137
159°31'30"W
22°14'N
159°28'W
0
0.5
1
1.5
km
1
0.5
0
mi

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
133
134
135
136
137
138
139
132
140
141
148
147
146
145
144
143
142
0 5 10
km
0 50 100
km
N
E
S
W

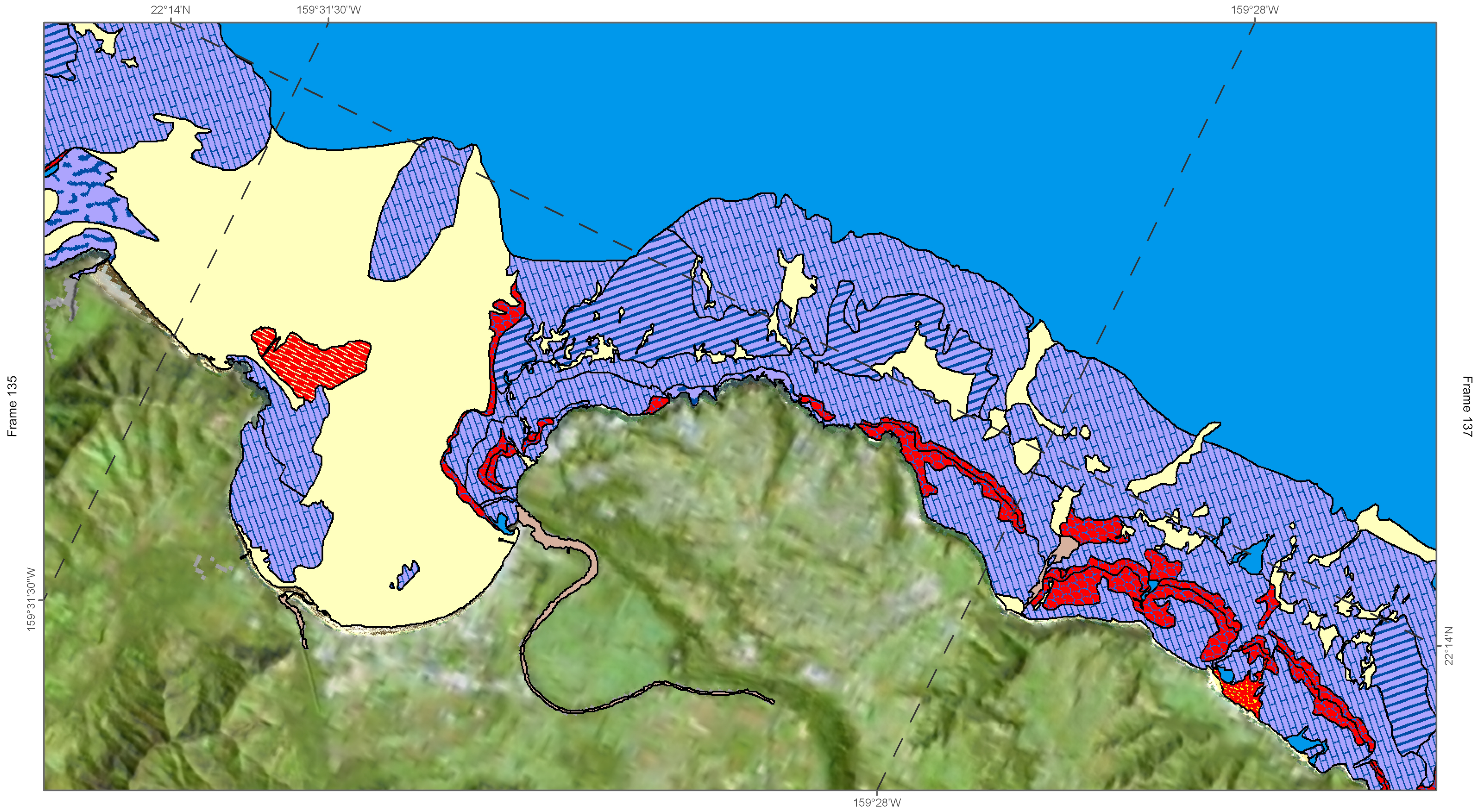
Biological Cover Types

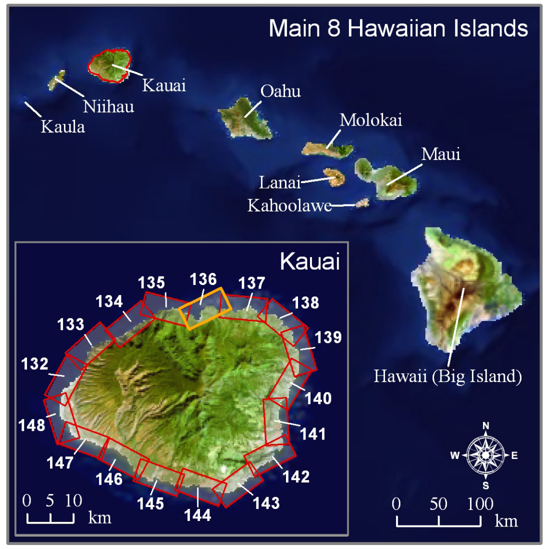
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▢ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▢ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▢ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 136)


22°14'N
159°31'30"W
159°28'W
Frame 135
159°31'30"W
Frame 137
22°14'N
159°28'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100 km
Kauai
135
136
137
134
138
133
139
132
140
148
141
147
146
142
145
144
143
0 5 10 km

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

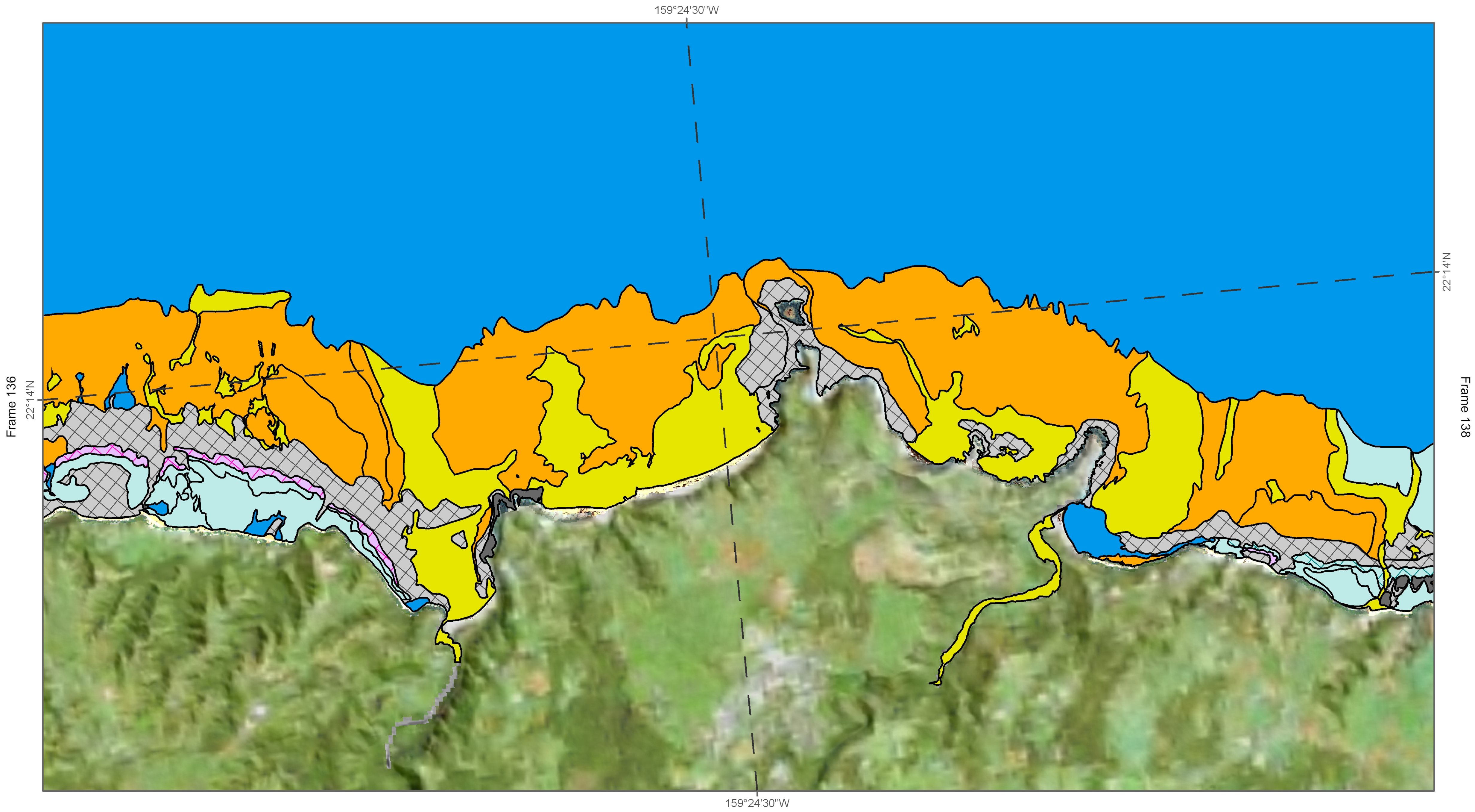
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 137)


159°24'30"W
22°14'N
Frame 136
22°14'N
Frame 138
159°24'30"W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
135
136
137
134
138
133
139
132
140
148
141
147
146
142
145
144
143
0 5 10 km
0 50 100 km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

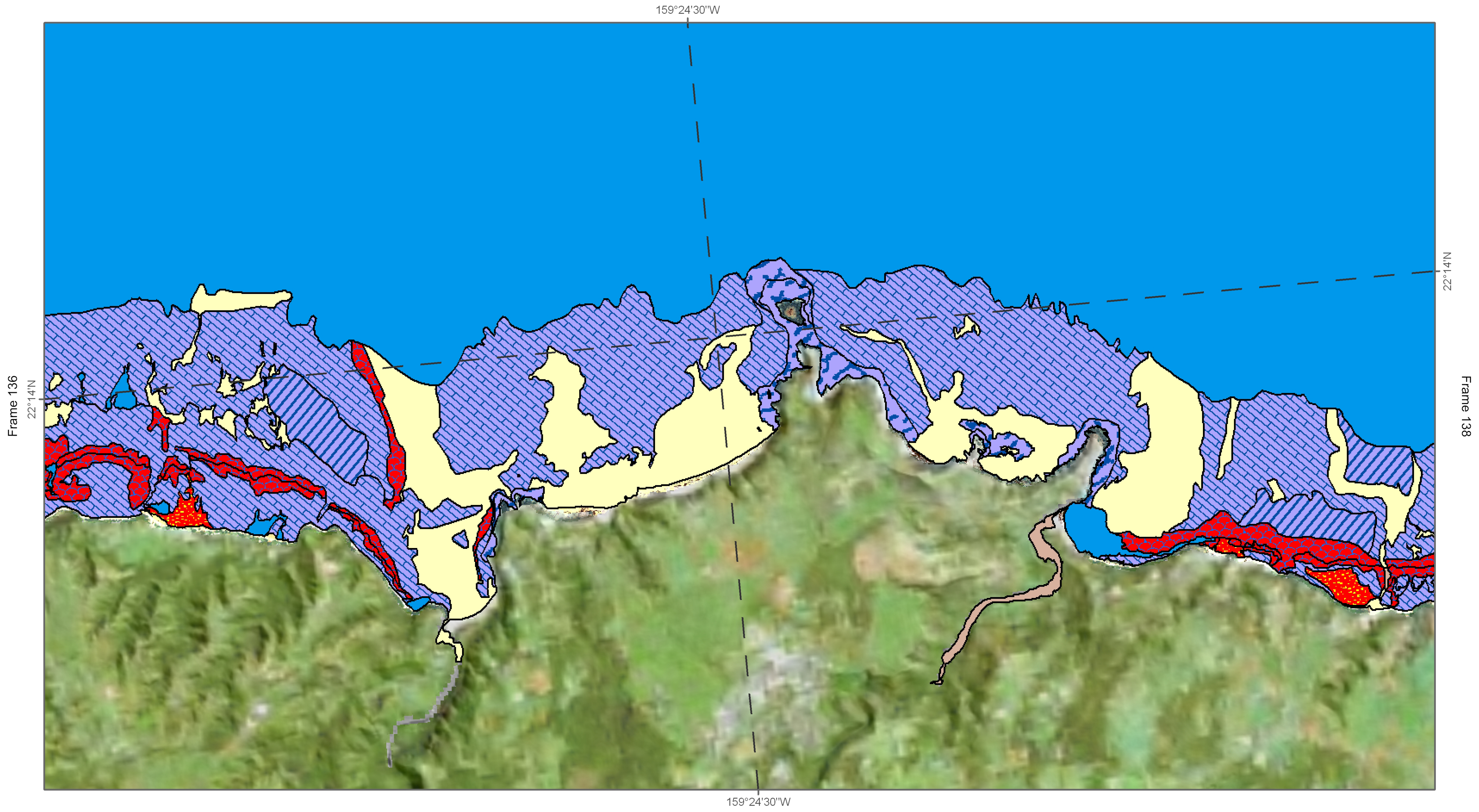
□ Minimum Mapping Unit (1 Acre)

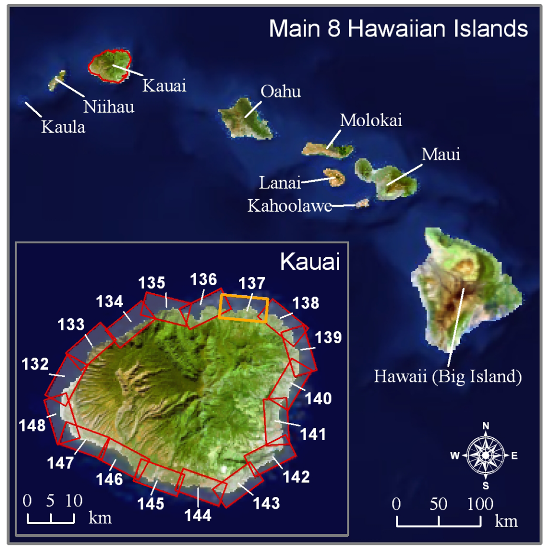
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 137)


159°24'30"W
22°14'N
Frame 136
22°14'N
Frame 138
159°24'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
133
134
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136
137
138
139
140
141
142
143
144
145
146
147
148
0 5 10 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- 🟪 Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

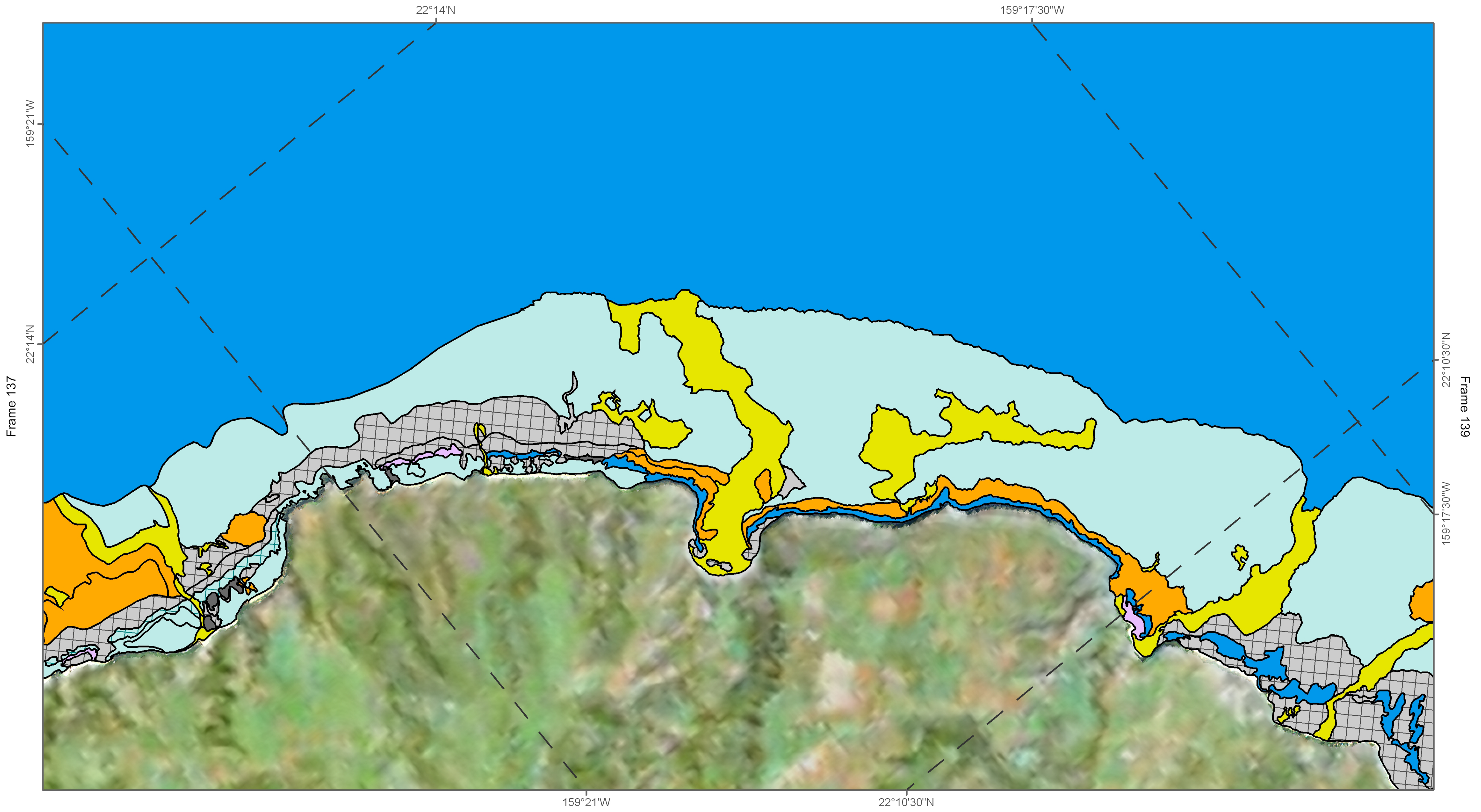
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 138)


22°14'N
159°17'30"W
159°21'W
22°14'N
Frame 137
22°10'30"N
159°17'30"W
Frame 139
159°21'W
22°10'30"N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
0 5 10
km
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

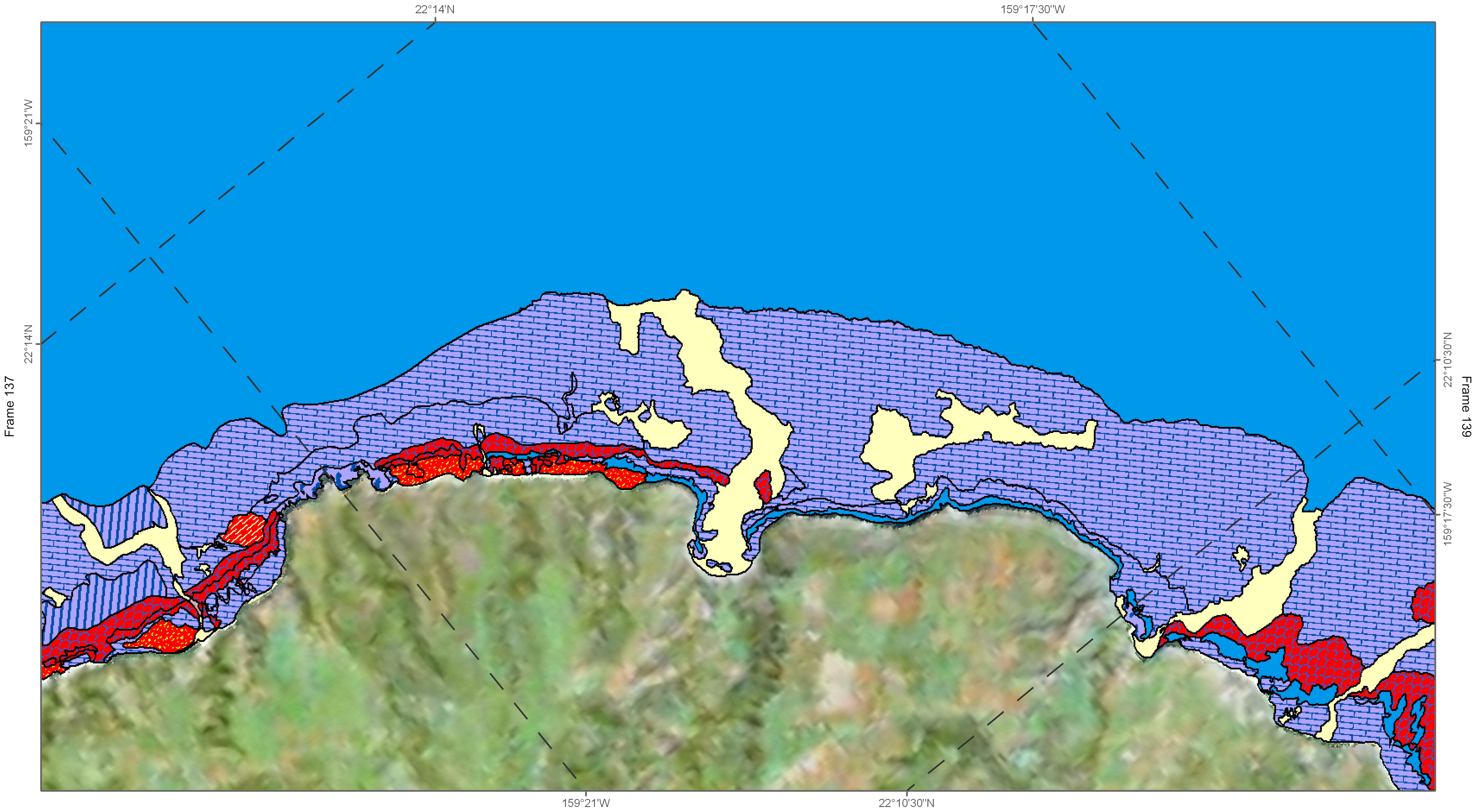
☐ Minimum Mapping Unit (1 Acre)

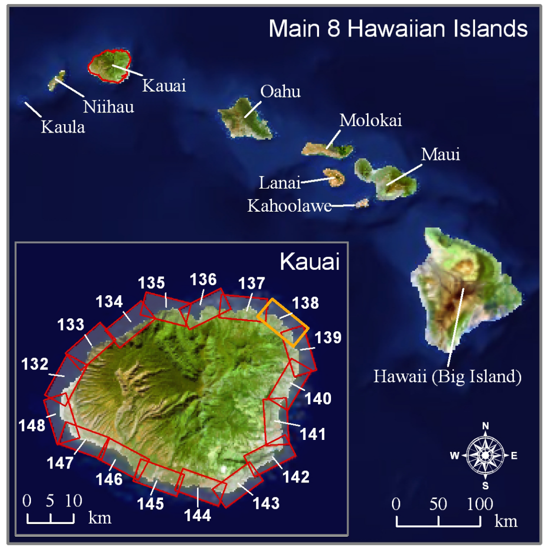
0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 138)


22°14'N
159°17'30"W
159°21'W
22°14'N
Frame 137
22°10'30"N
159°17'30"W
Frame 139
159°21'W
22°10'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

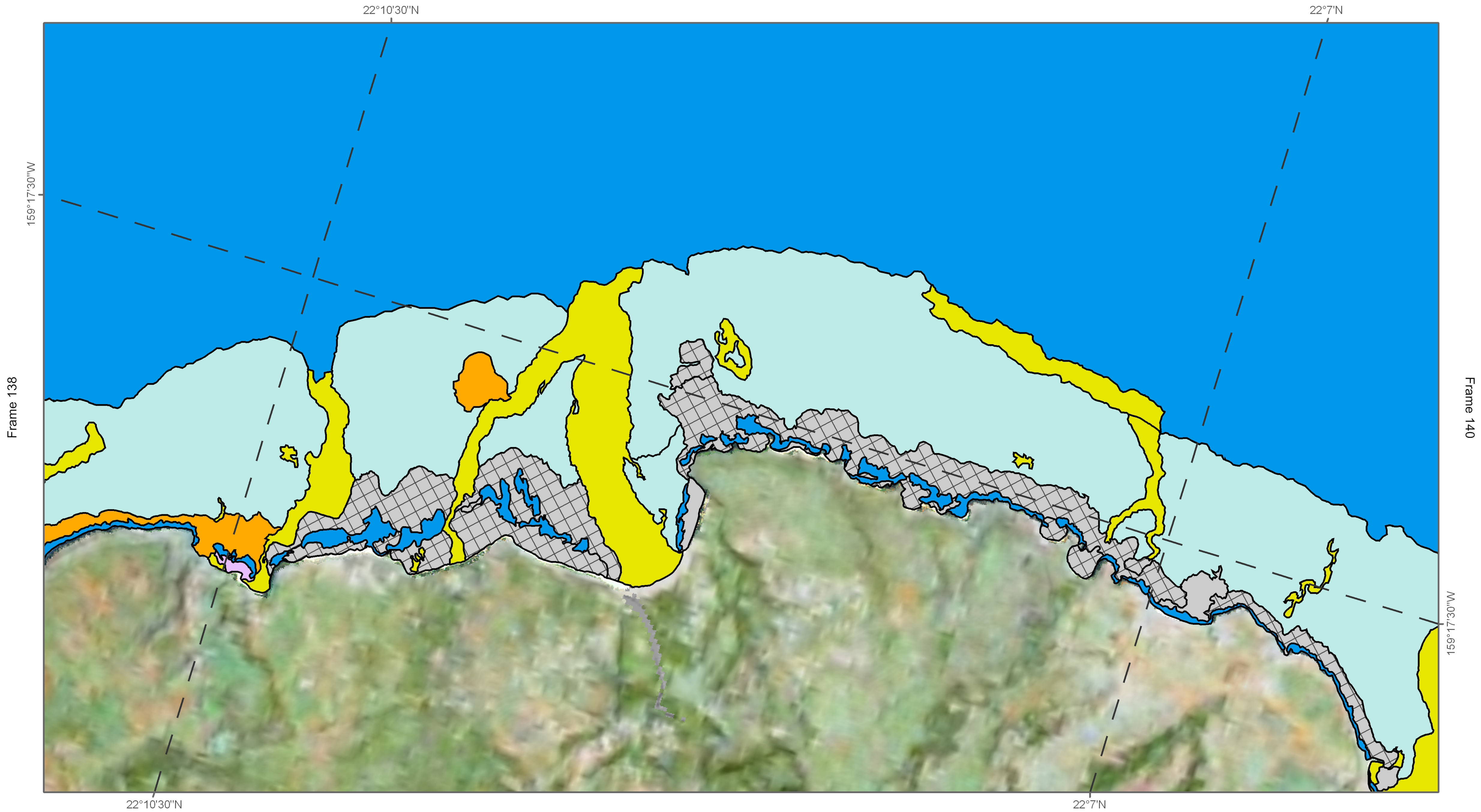
□ Minimum Mapping Unit (1 Acre)

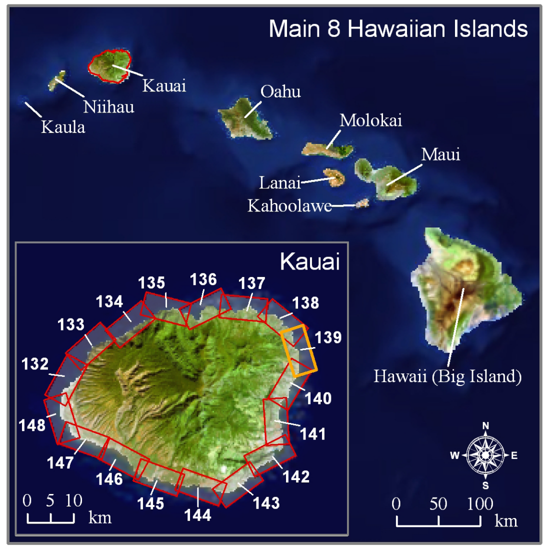
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 139)


22°10'30"N
22°7'N
159°17'30"W
Frame 138
Frame 140
159°17'30"W
22°10'30"N
22°7'N
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
134
135
136
137
138
133
139
132
140
141
148
147
146
142
145
144
143
0 5 10
km
0 50 100
km
N
W
E
S

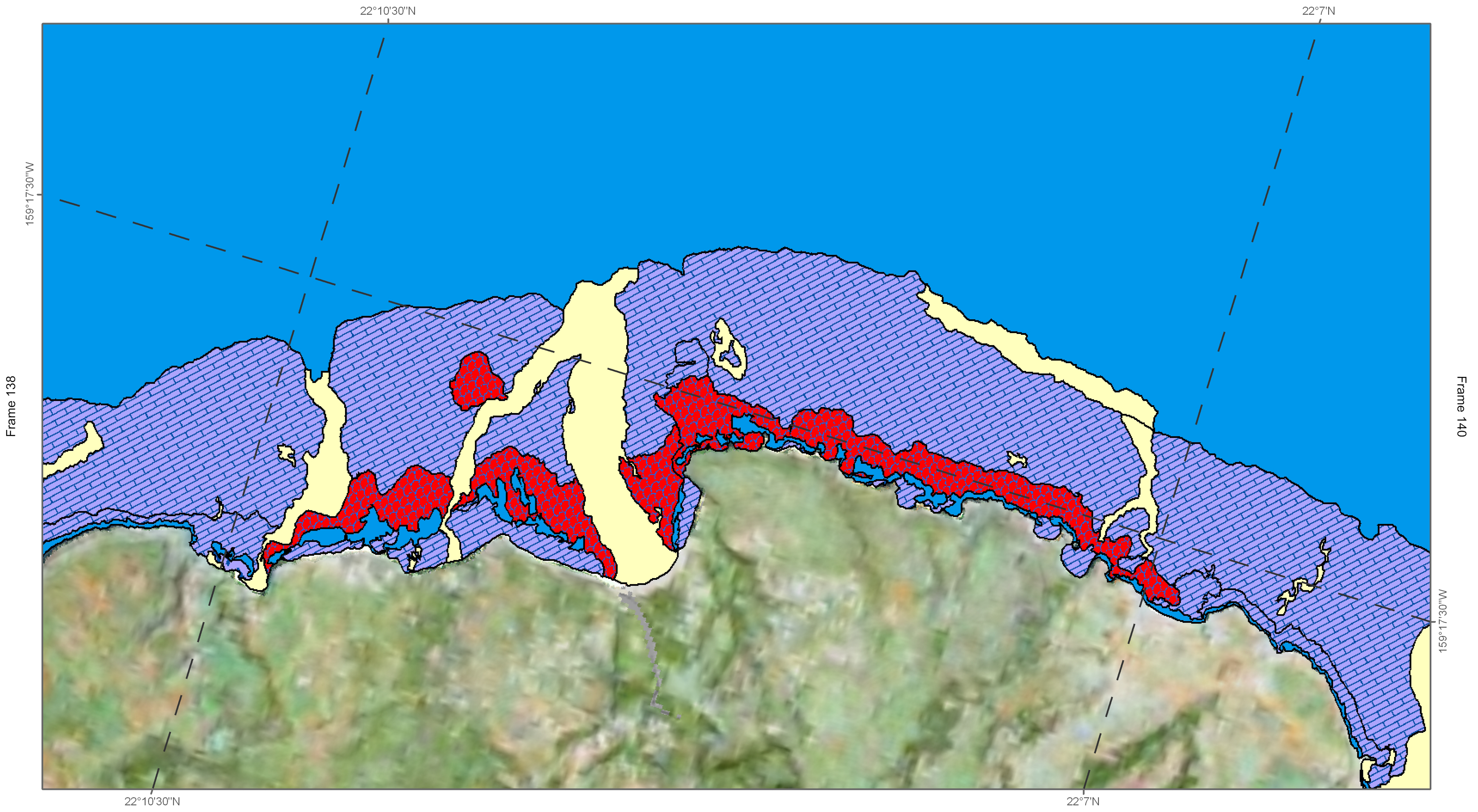
Biological Cover Types

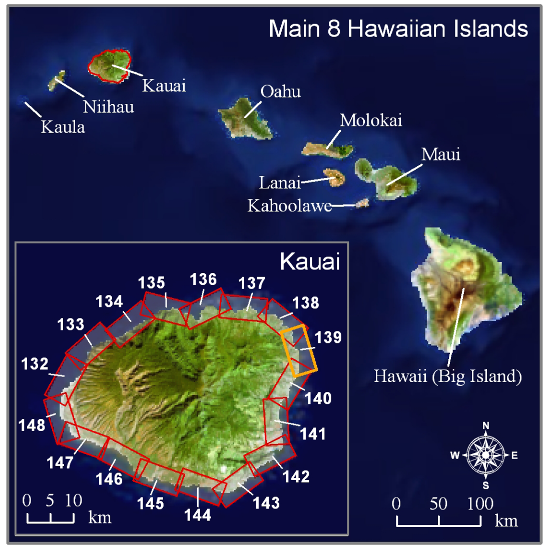
🟧 Coral 10%-<50%
▨ Coral 50%-<90%
🟥 Coral 90%-100%
▨ Seagrass 10%-<50%
⬜ Macroalgae 10%-<50%
▨ Macroalgae 50%-<90%
⬛ Macroalgae 90%-100%
⬜ Coralline Algae 10%-<50%
▨ Coralline Algae 50%-<90%
⬜ Turf 10%-<50%
▨ Turf 50%-<90%
⬛ Turf 90%-100%
🟩 Emergent Vegetation 10%-<50%
▨ Emergent Vegetation 50%-<90%
🟩 Emergent Vegetation 90%-100%
🟫 Uncolonized 50%-<90%
🟨 Uncolonized 90%-100%
⬜ Unclassified
🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 139)


22°10'30"N
22°7'N
159°17'30"W
Frame 138
Frame 140
159°17'30"W
22°10'30"N
22°7'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
134
135
136
137
138
133
139
132
140
148
141
147
146
142
145
144
143
0 5 10 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

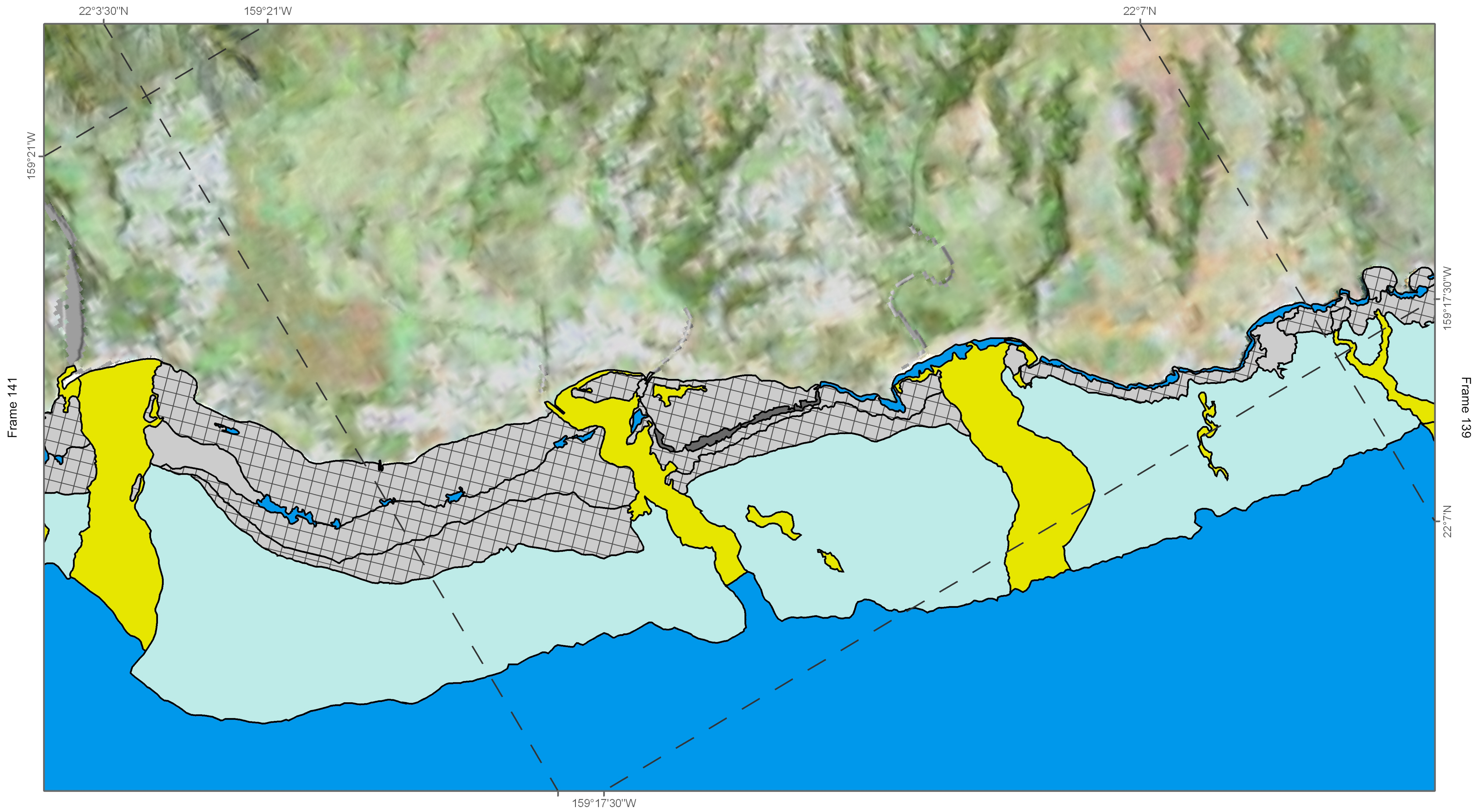
☐ Minimum Mapping Unit (1 Acre)

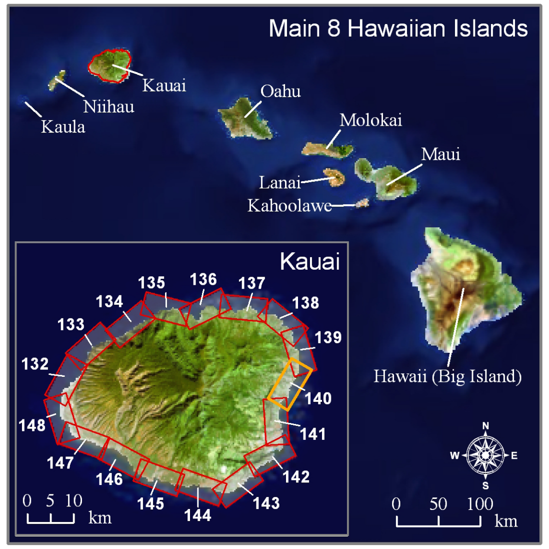
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 140)


22°3'30"N
159°21'W
22°7'N
159°21'W
159°17'30"W
22°7'N
159°17'30"W
Frame 141
Frame 139


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
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138
139
140
141
142
143
144
145
146
147
148
0 5 10
km
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

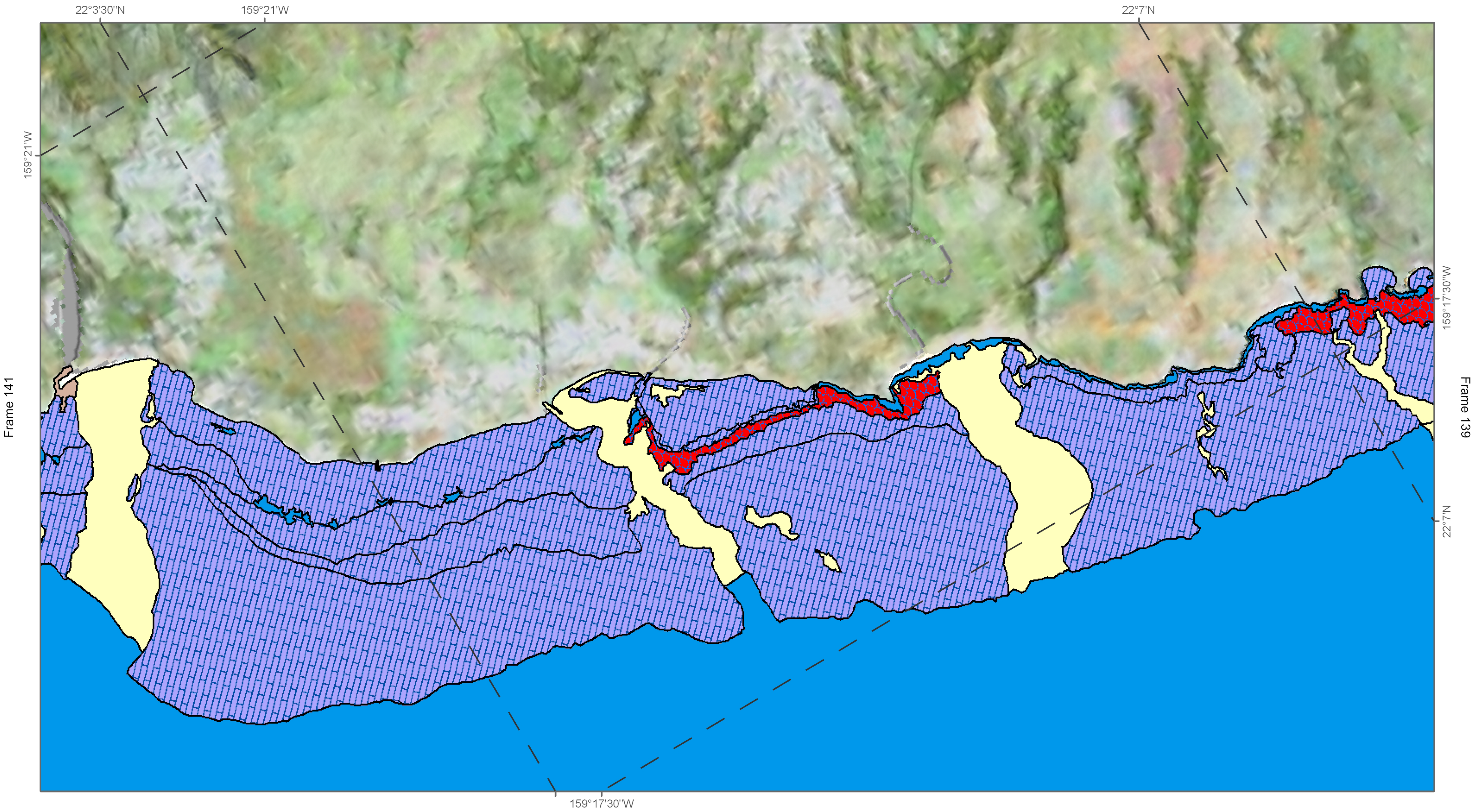
☐ Minimum Mapping Unit (1 Acre)

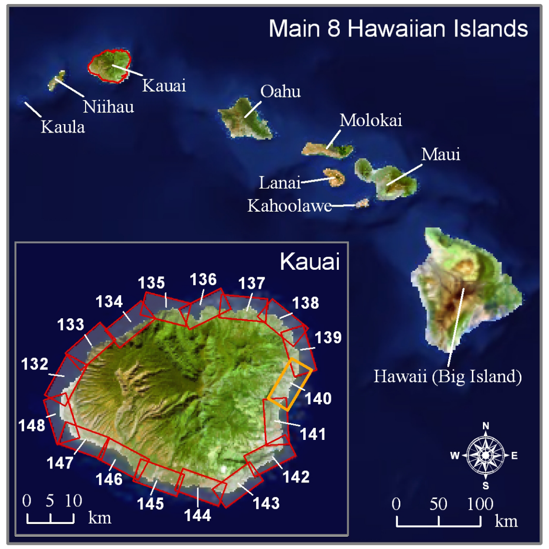
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 140)


22°3'30"N
159°21'W
22°7'N
159°21'W
Frame 141
159°17'30"W
Frame 139
22°7'N
159°17'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
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140
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143
144
145
146
147
148
0 5 10 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ■ Mud
- ■ Sand
- ■ Unknown

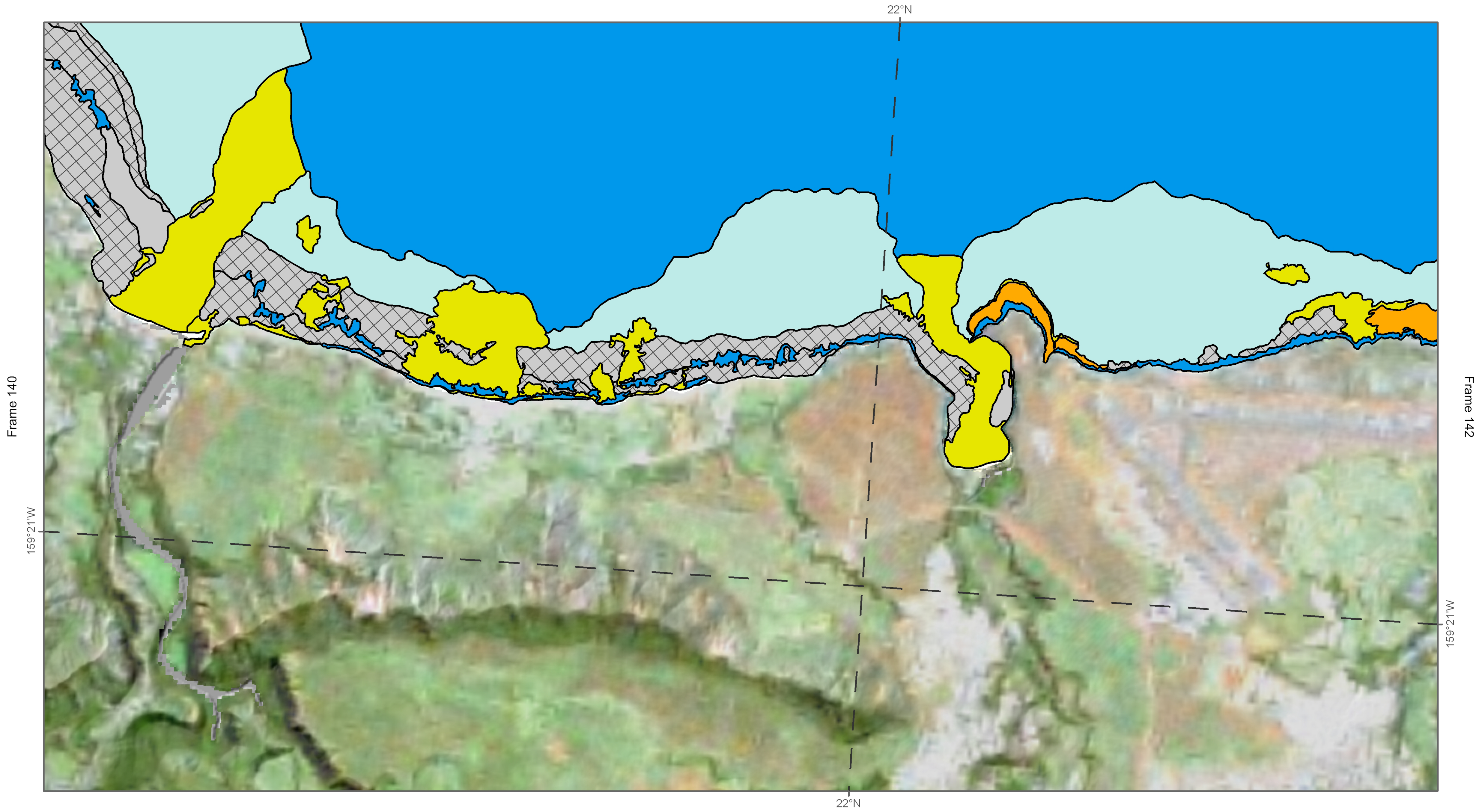
☐ Minimum Mapping Unit (1 Acre)

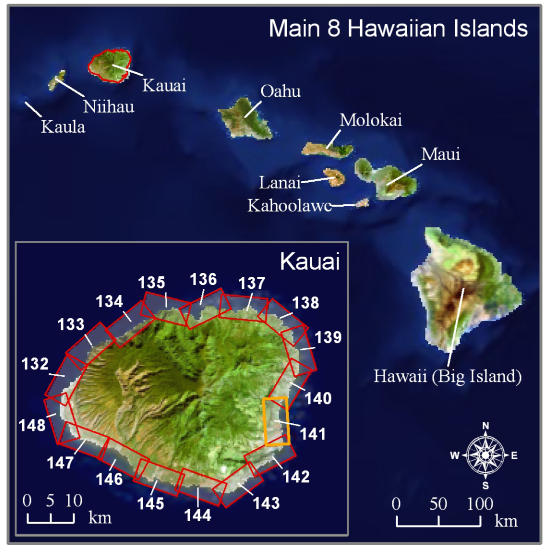
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 141)


22°N
Frame 140
159°21'W
Frame 142
159°21'W
22°N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100
km
Kauai
134
135
136
137
138
133
139
132
140
148
141
147
146
142
145
144
143
0 5 10
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- 🟦 Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

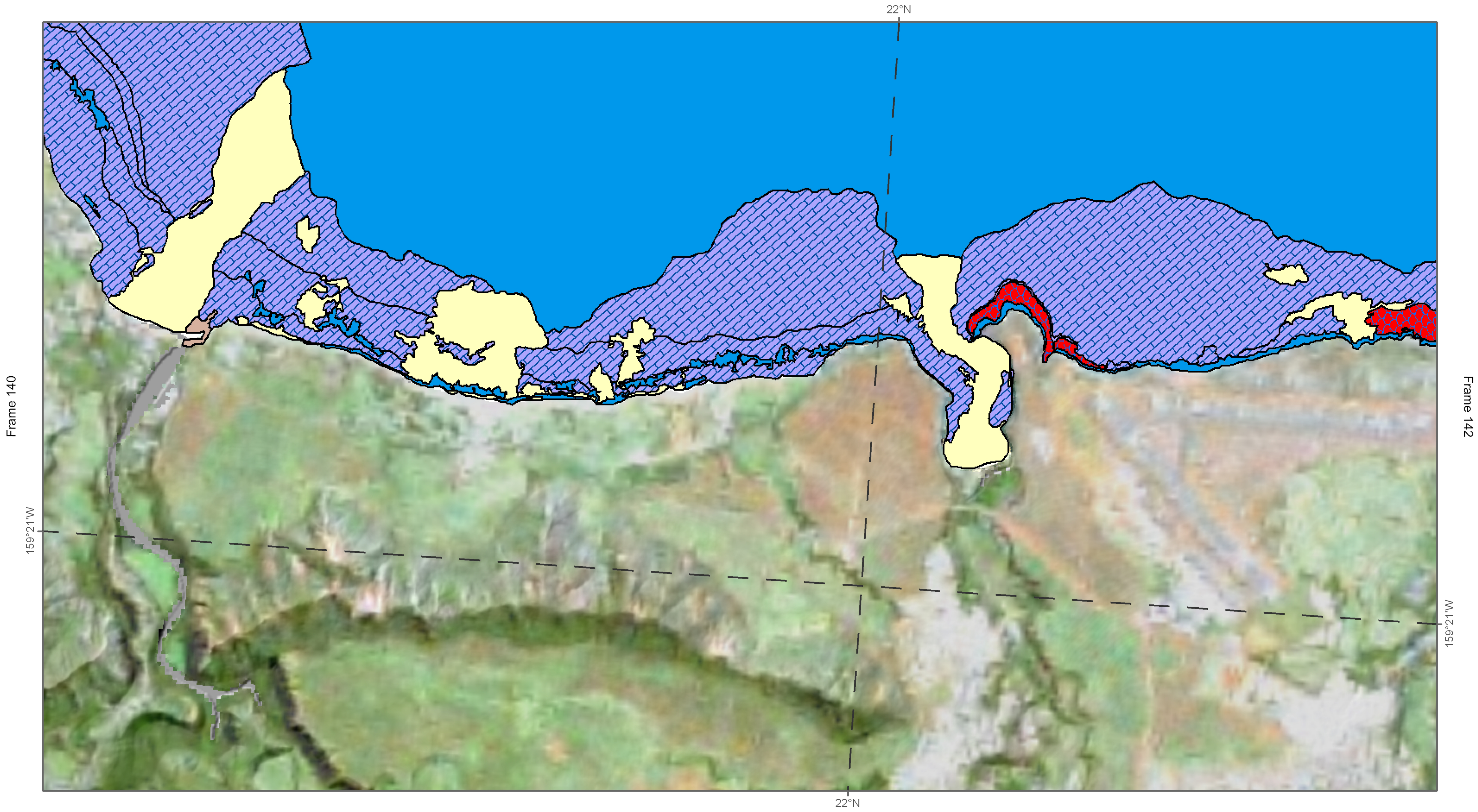
□ Minimum Mapping Unit (1 Acre)

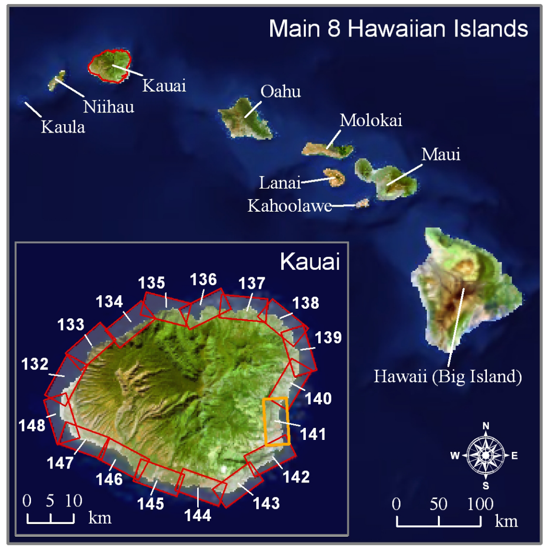
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 141)


22°N
Frame 140
159°21'W
Frame 142
159°21'W
22°N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
133
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148
0 5 10 km
0 50 100 km
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Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

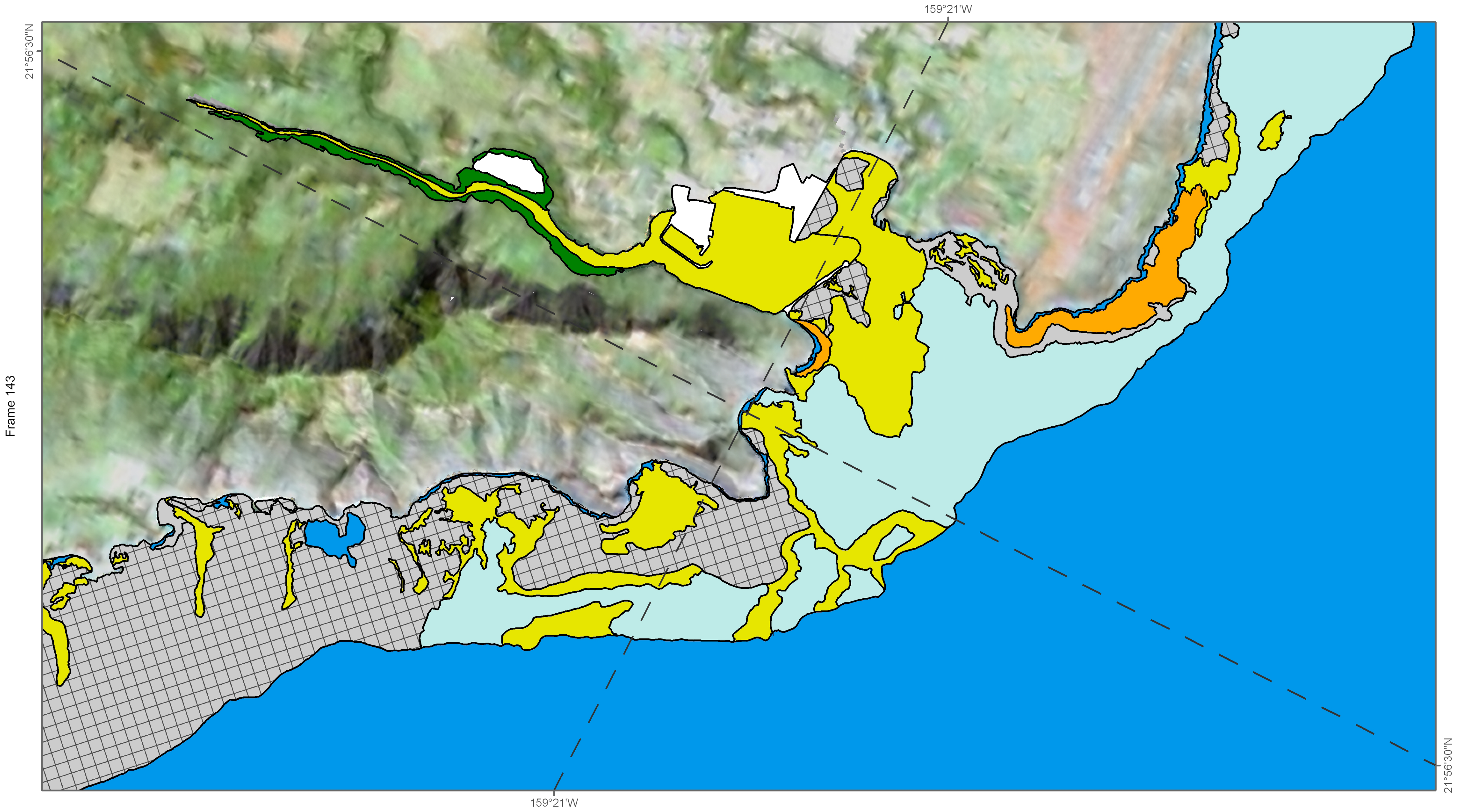
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 142)


159°21'W
21°56'30"N
Frame 143
159°21'W
21°56'30"N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
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147
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0 5 10 km
0 50 100 km
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

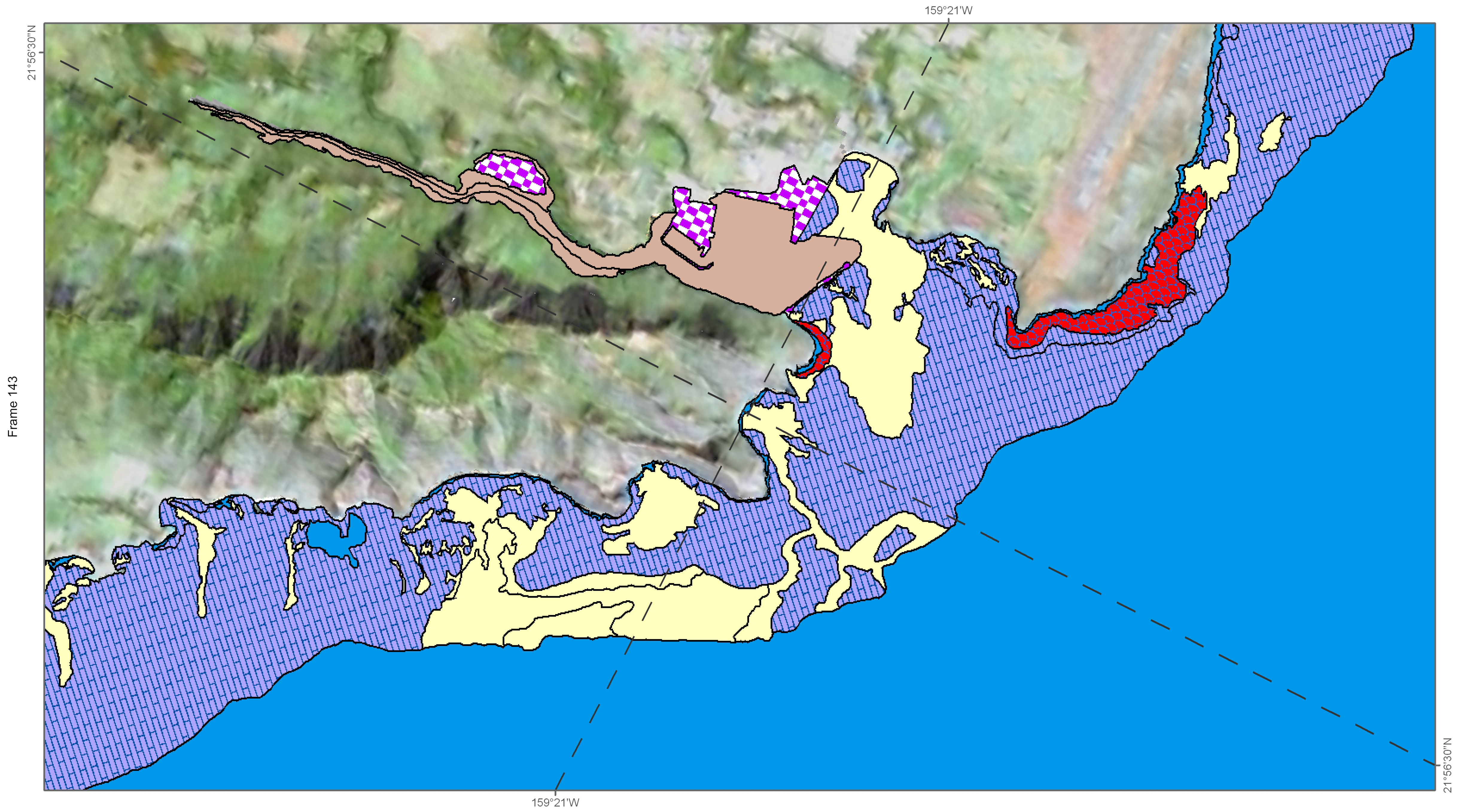
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 142)


159°21'W
21°56'30"N
Frame 143
159°21'W
21°56'30"N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
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145
146
147
148
0 5 10
km
N
W
E
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0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

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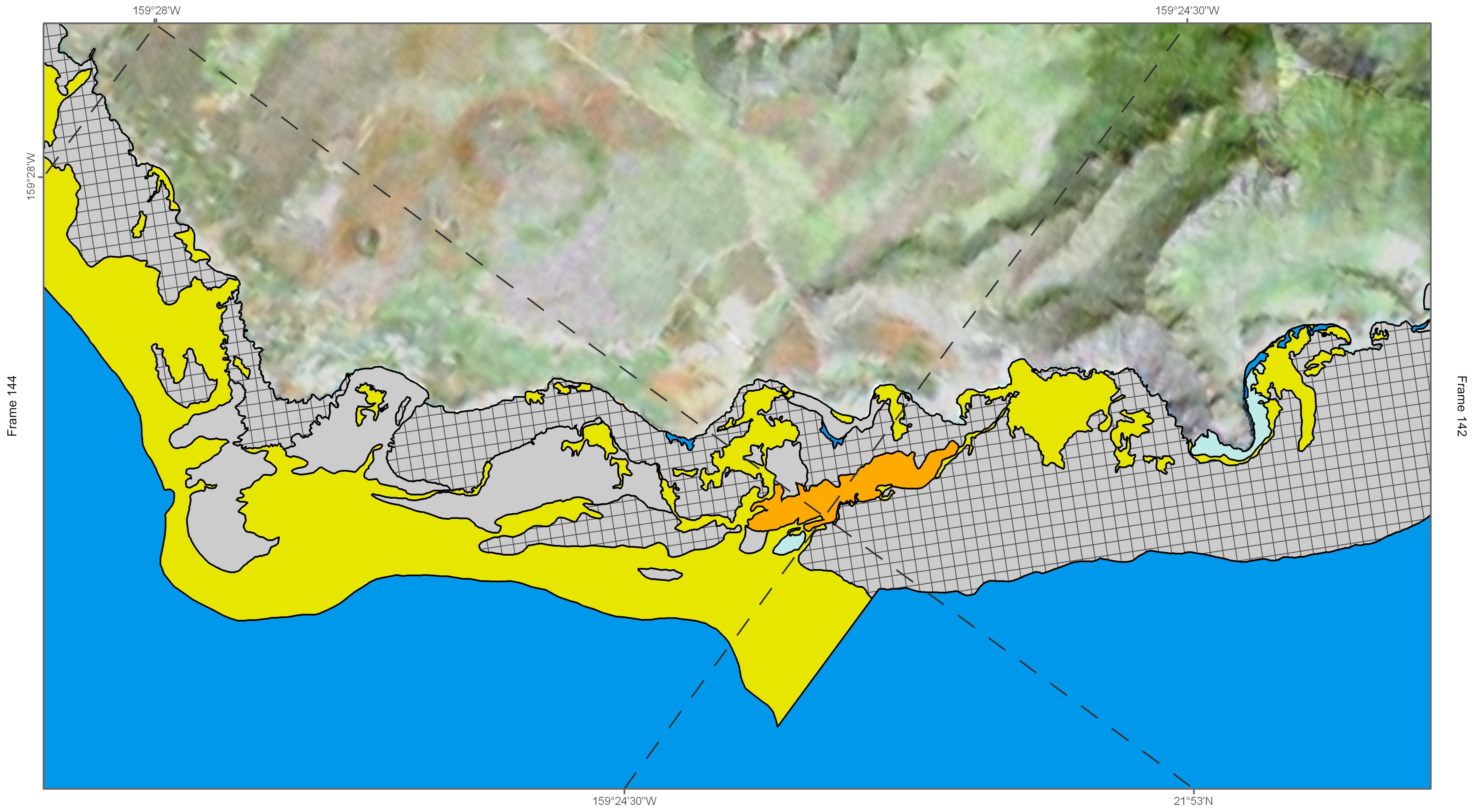
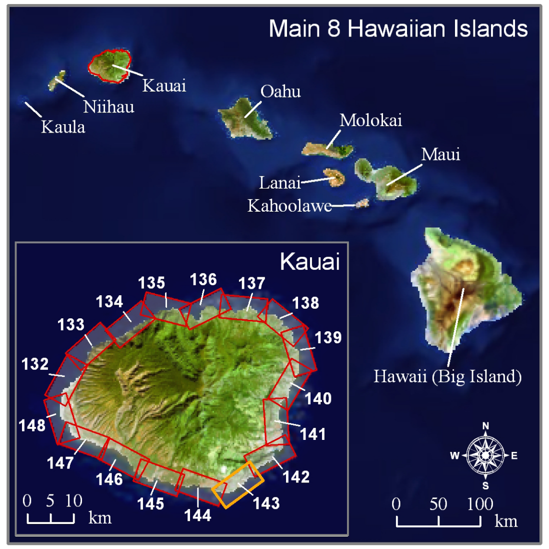
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 143)


159°28'W
159°24'30"W
159°28'W
Frame 144
Frame 142
159°24'30"W
21°53'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
134
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132
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148
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146
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145
144
143
0 5 10
km
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- 🟦 Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- 🟪 Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- ■ Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
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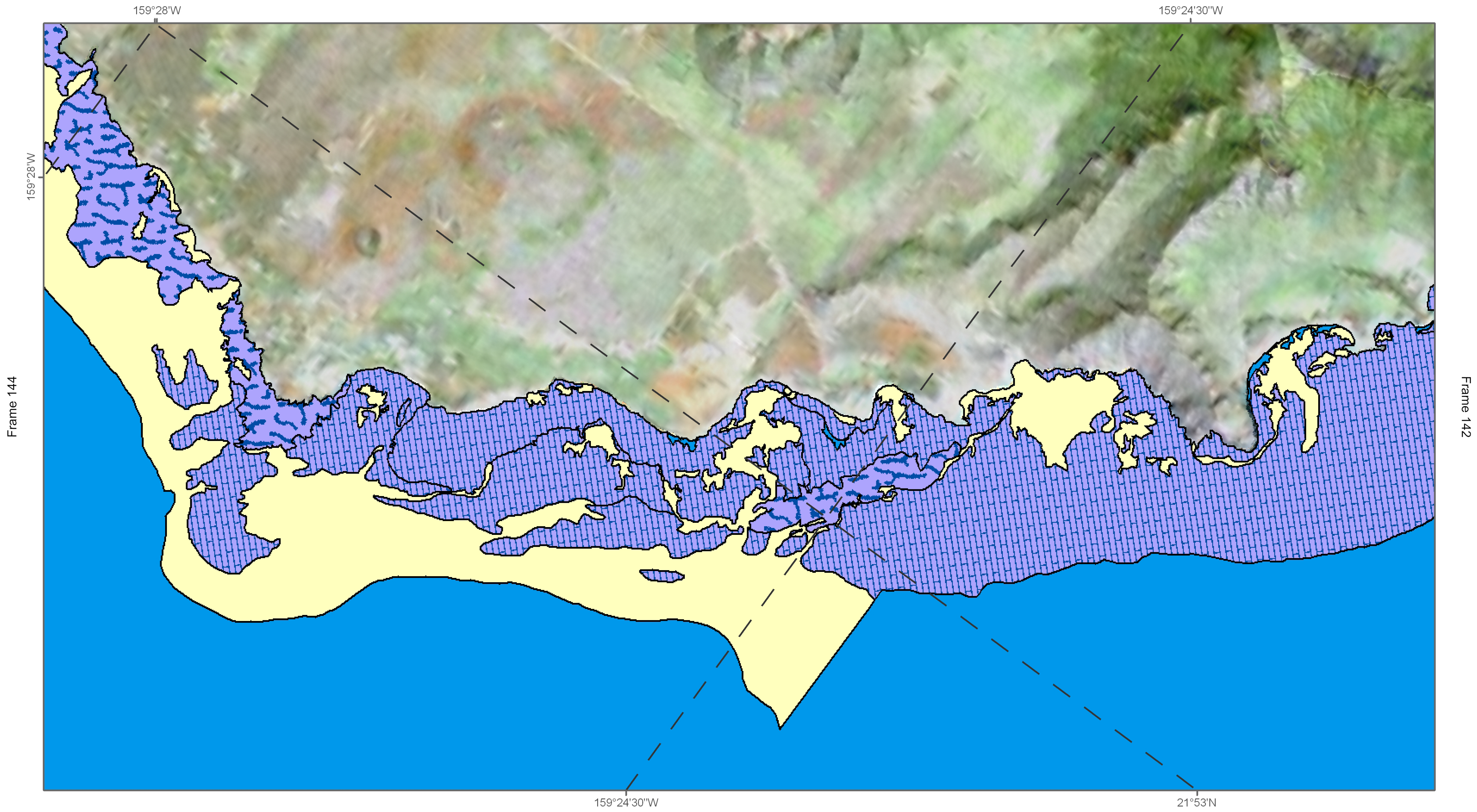
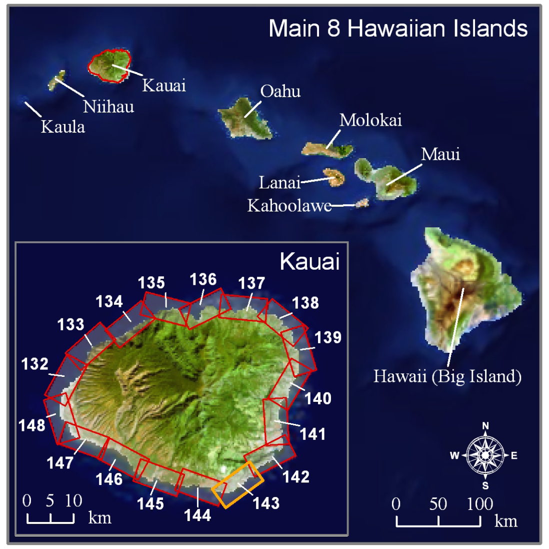
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 143)


159°28'W
159°24'30"W
159°28'W
Frame 144
Frame 142
159°24'30"W
21°53'N
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
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148
0 5 10
km
0 50 100
km
N
E
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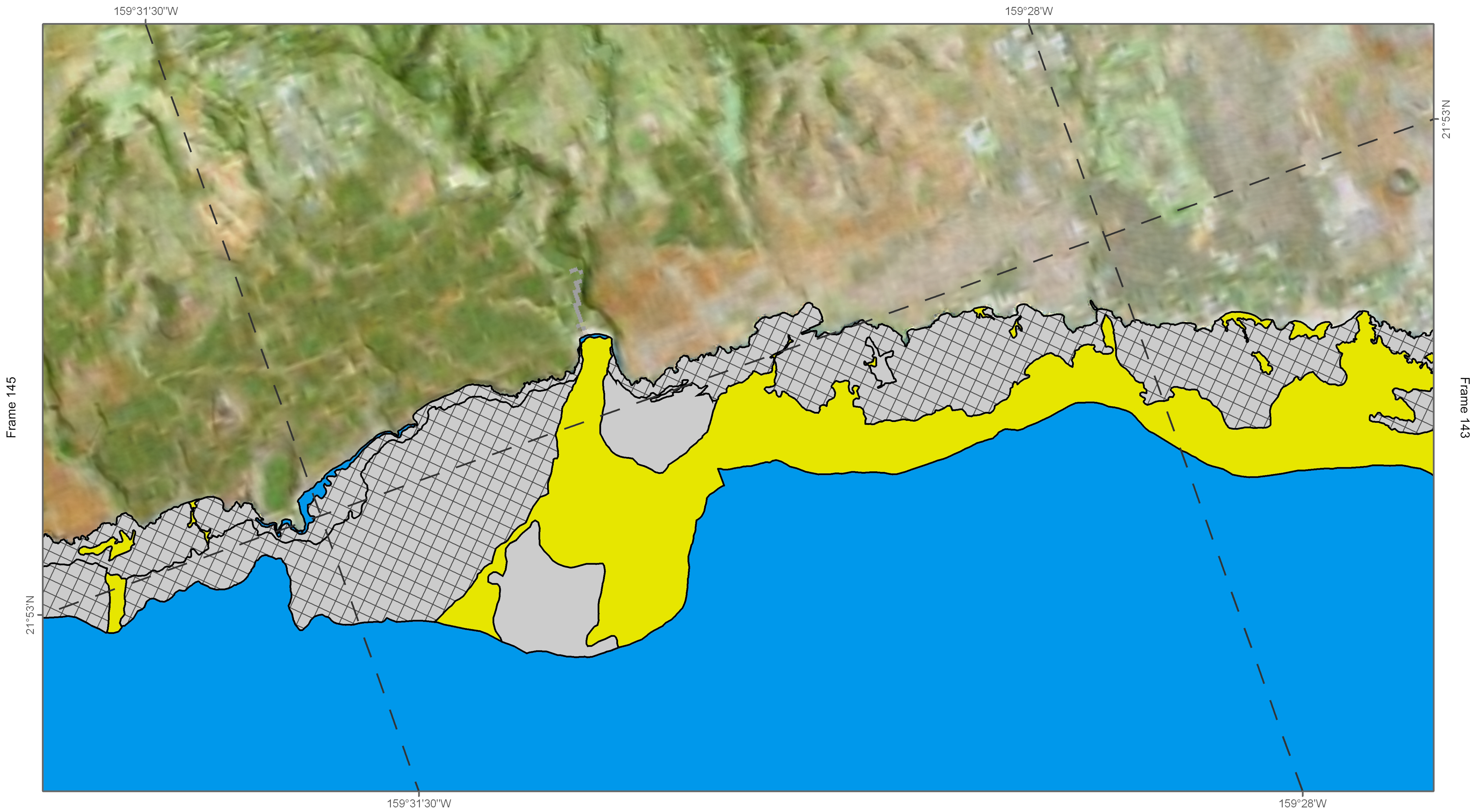
Geomorphological Structure Types

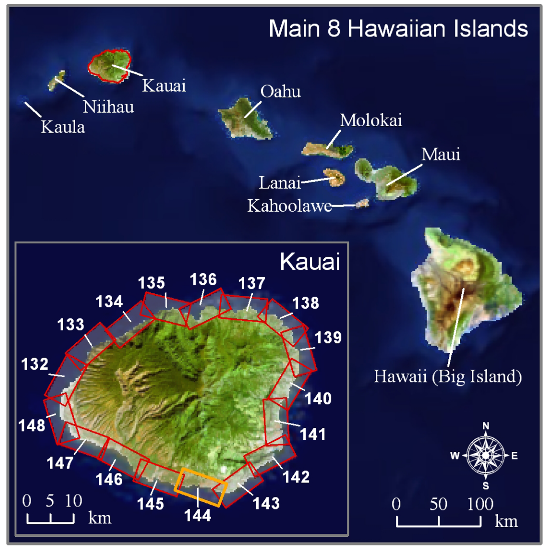
- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 144)


159°31'30"W
159°28'W
21°53'N
21°53'N
Frame 145
Frame 143
159°31'30"W
159°28'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
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0 5 10 km
0 50 100 km
N
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W
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▨ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ▨ Macroalgae 90%-100%
- ▨ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▨ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ▨ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ▨ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

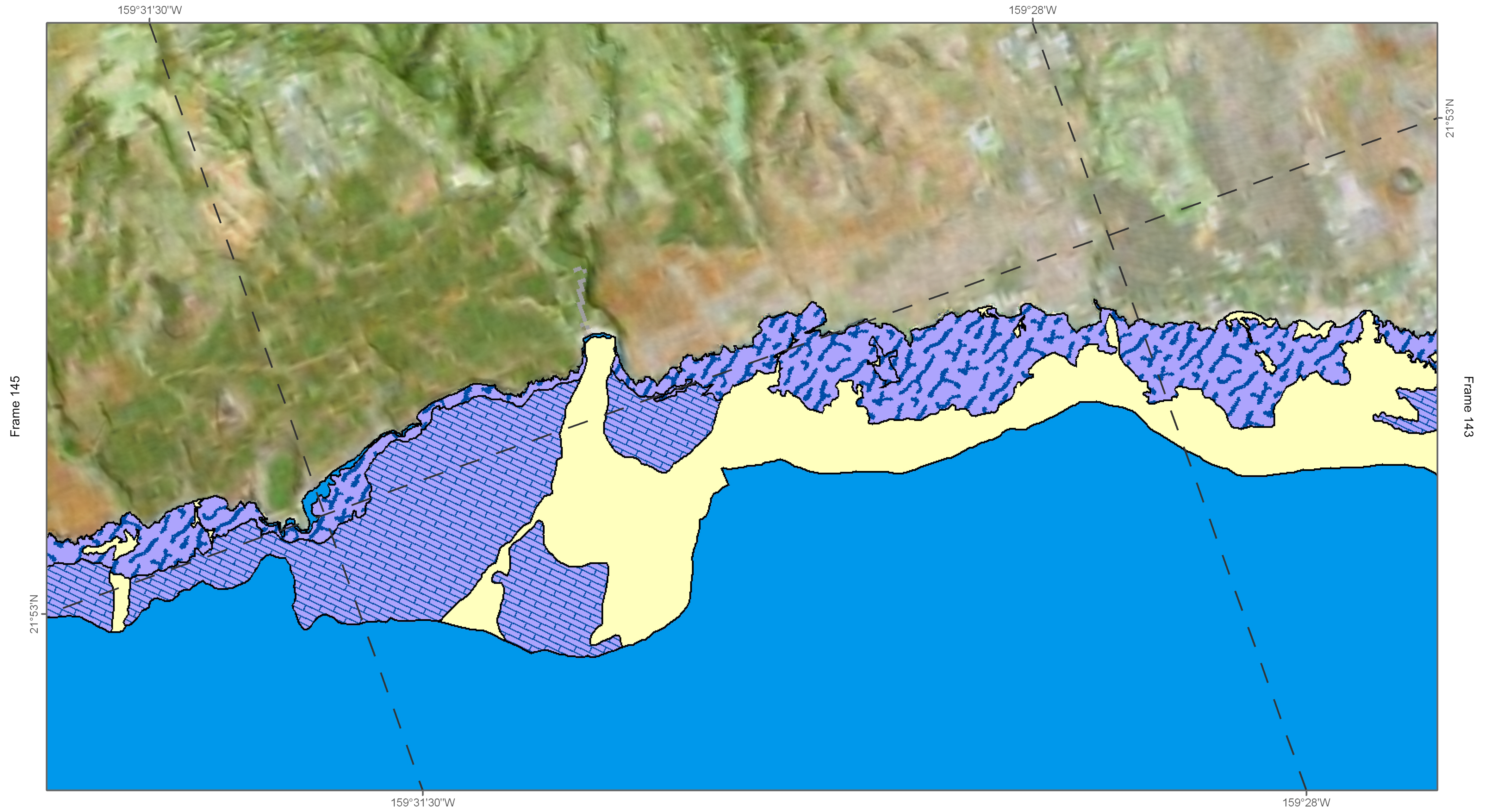
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007

For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 144)


159°31'30"W
159°28'W
21°53'N
Frame 145
Frame 143
21°53'N
159°31'30"W
159°28'W
0 0.5 1 1.5 km
1 0.5 0 mi

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
132
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147
148
0 5 10 km
0 50 100 km
N
W
E
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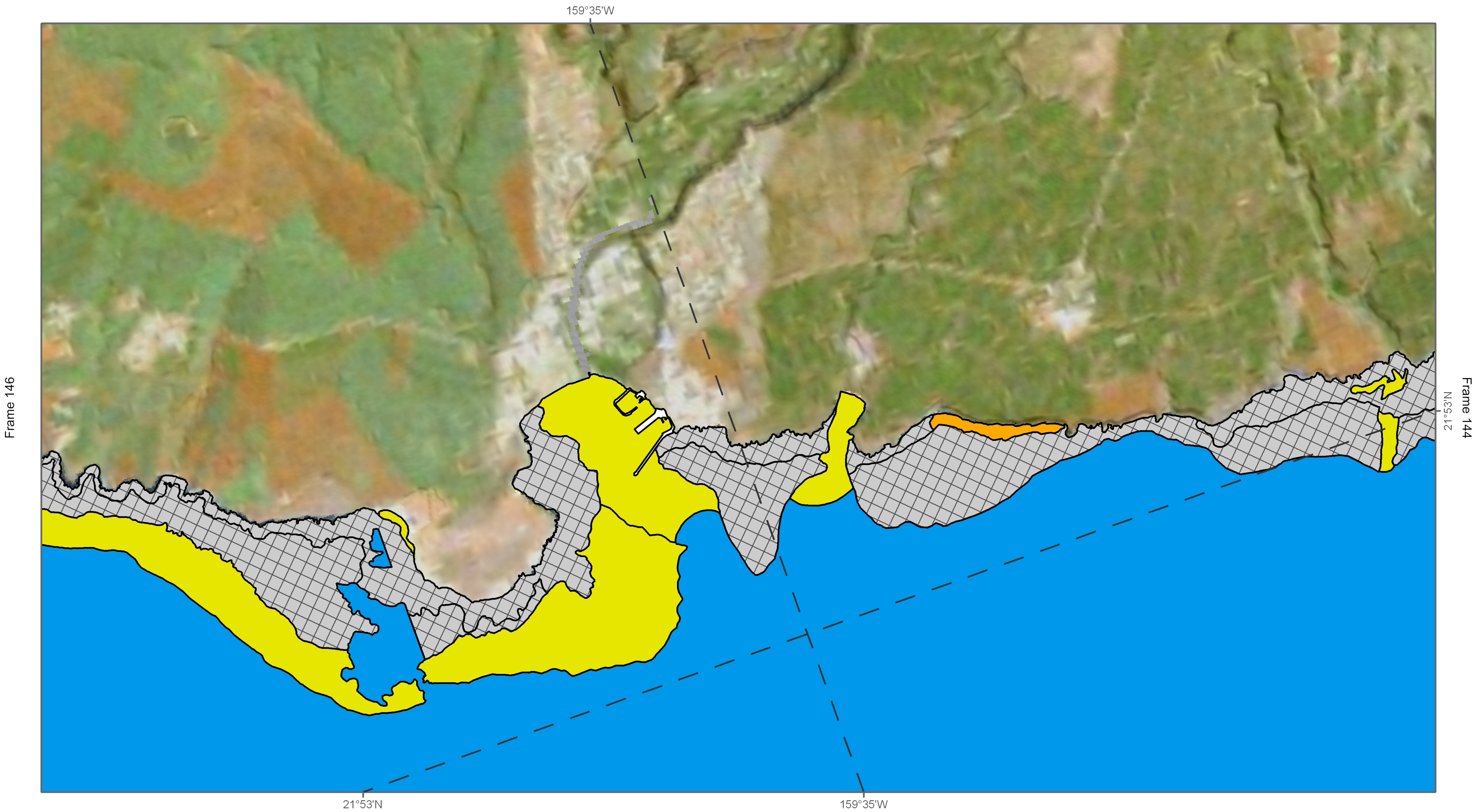
Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 145)


159°35'W
Frame 146
Frame 144
21°53'N
21°53'N
159°35'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
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0 5 10 km
0 50 100 km
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Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▭ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▭ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▭ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

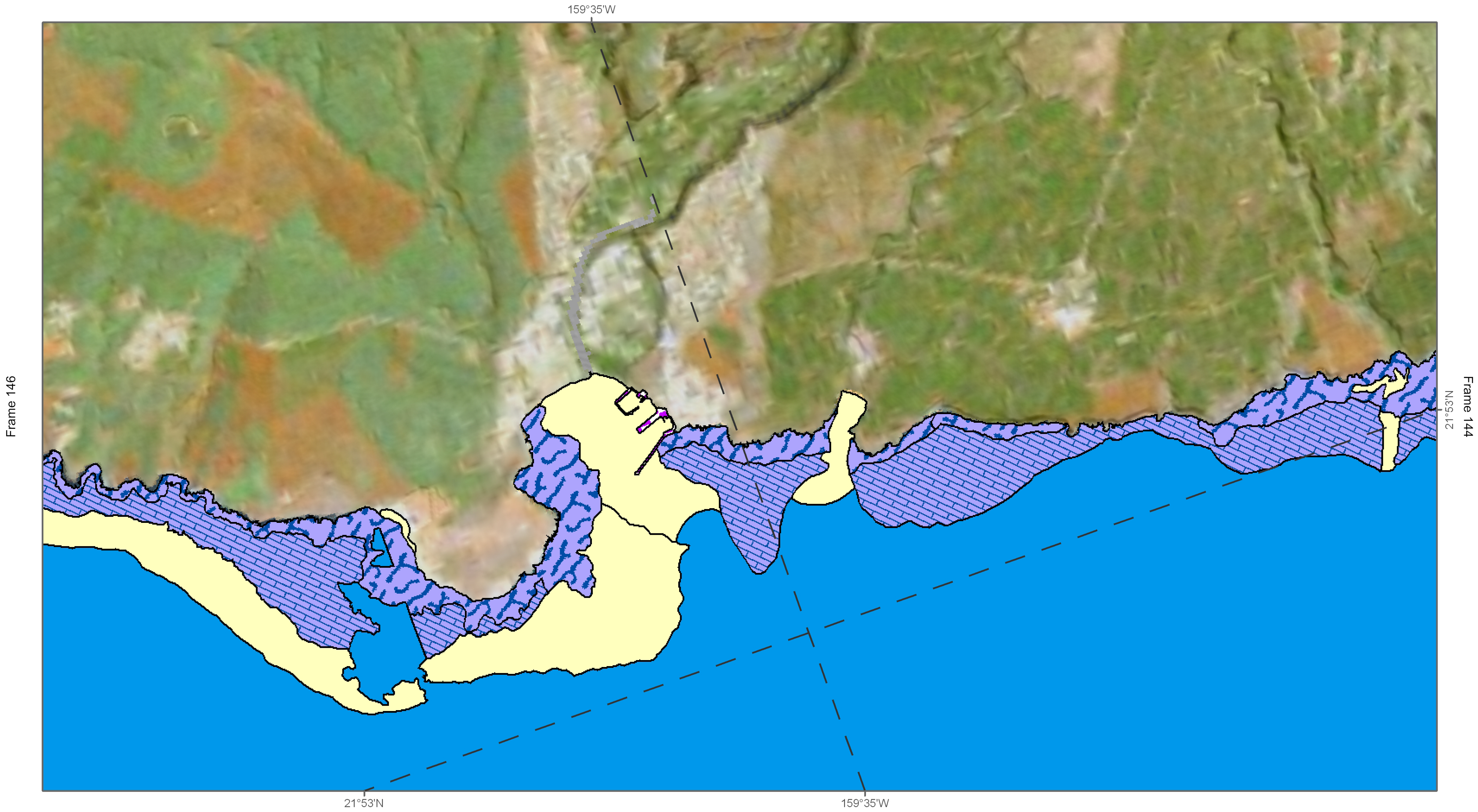
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 145)



159°35'W
Frame 146
Frame 144
21°53'N
21°53'N
159°35'W

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
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0 5 10 km
0 50 100 km

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

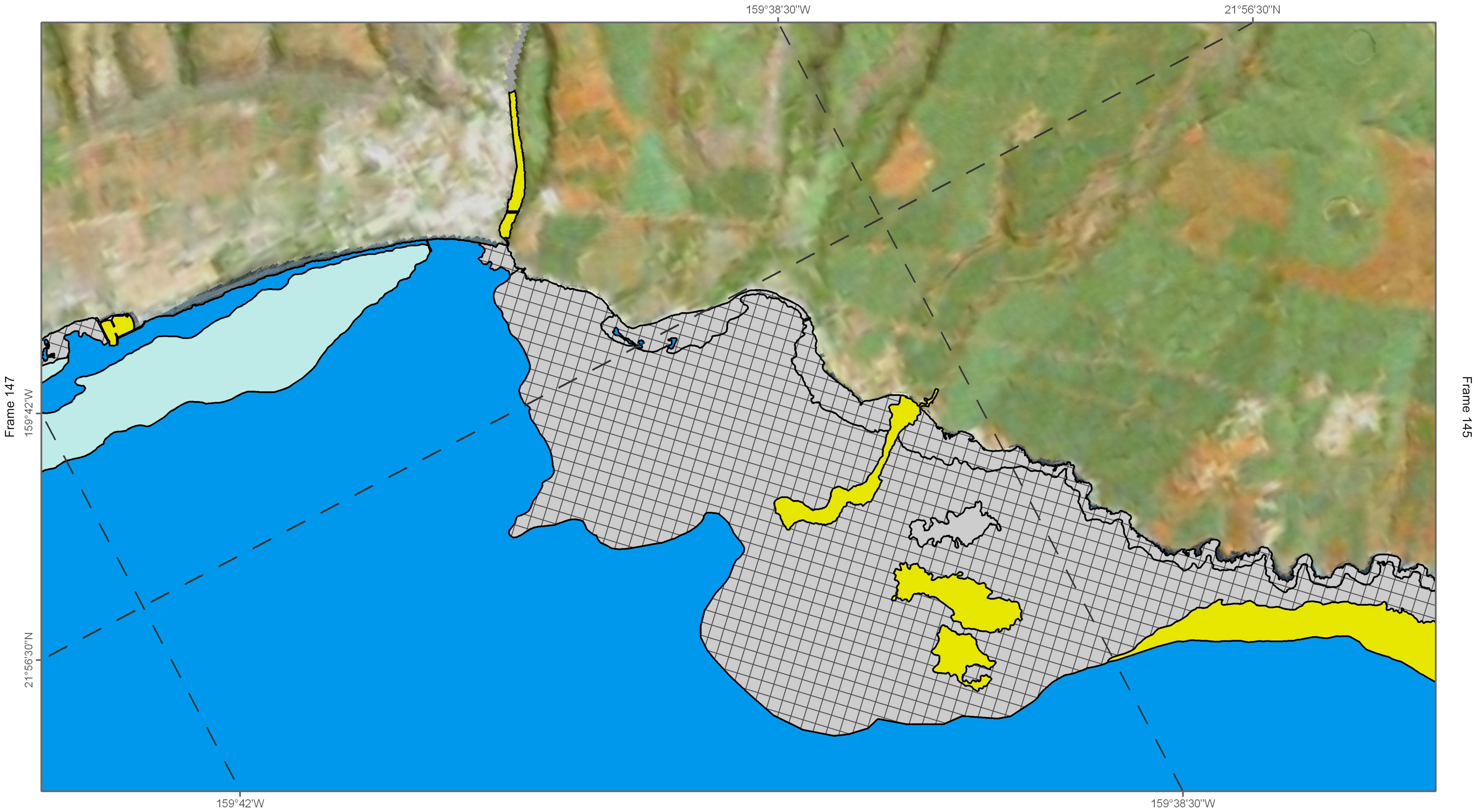
☐ Minimum Mapping Unit (1 Acre)

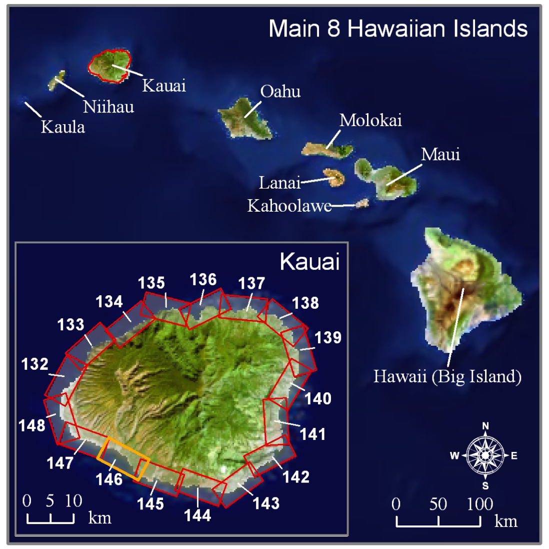
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 146)


159°38'30"W
21°56'30"N
Frame 147
159°42'W
21°56'30"N
Frame 145
159°42'W
159°38'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
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143
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km
N
W
E
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0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
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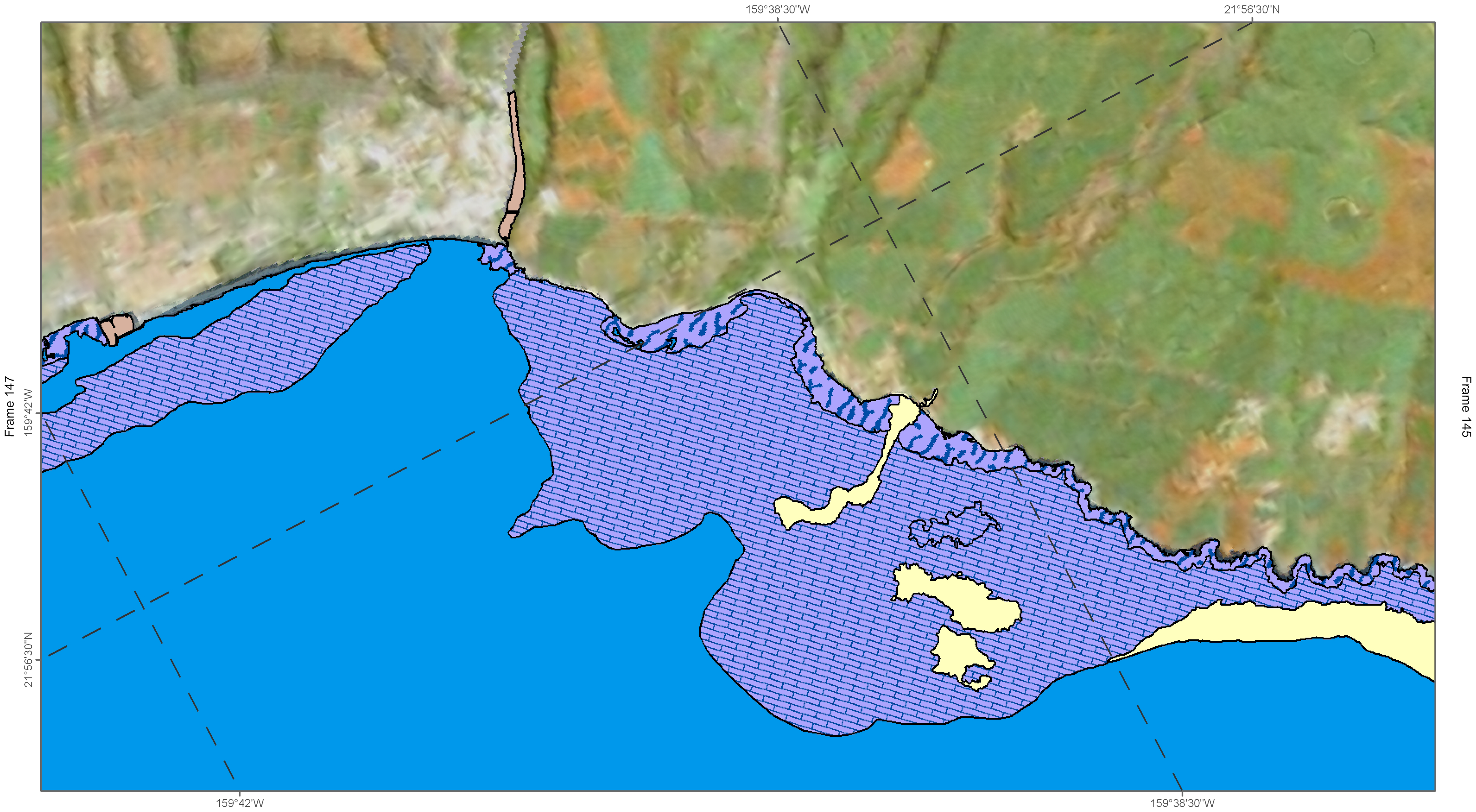
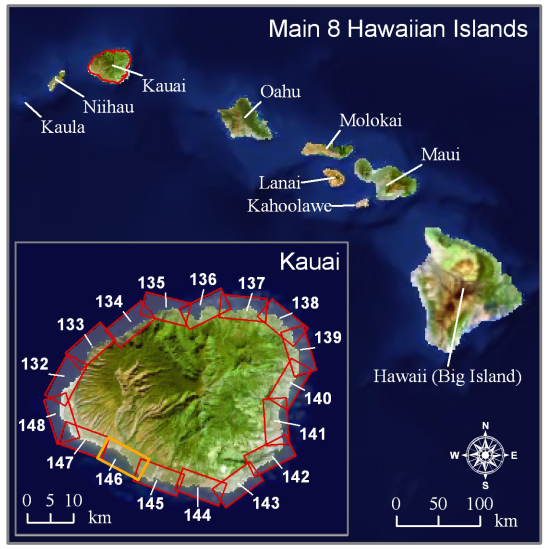
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 146)


159°38'30"W
21°56'30"N
Frame 147
159°42'W
21°56'30"N
Frame 145
159°42'W
159°38'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
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0 5 10
km
0 50 100
km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
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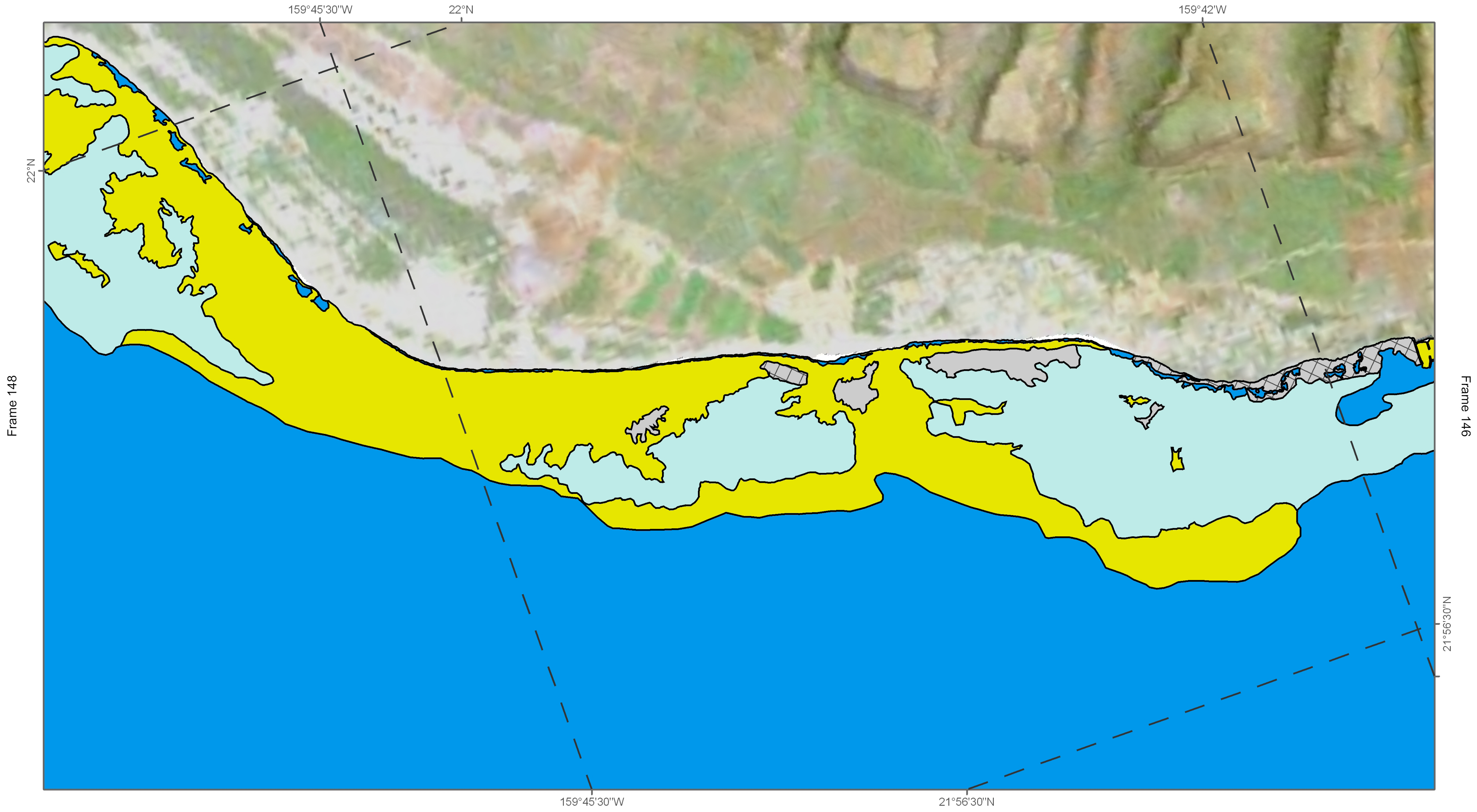
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 147)


159°45'30"W
22°N
159°42'W
22°N
Frame 148
Frame 146
21°56'30"N
159°45'30"W
21°56'30"N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
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147
148
0 5 10 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- 🟦 Macroalgae 90%-100%
- 🟪 Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

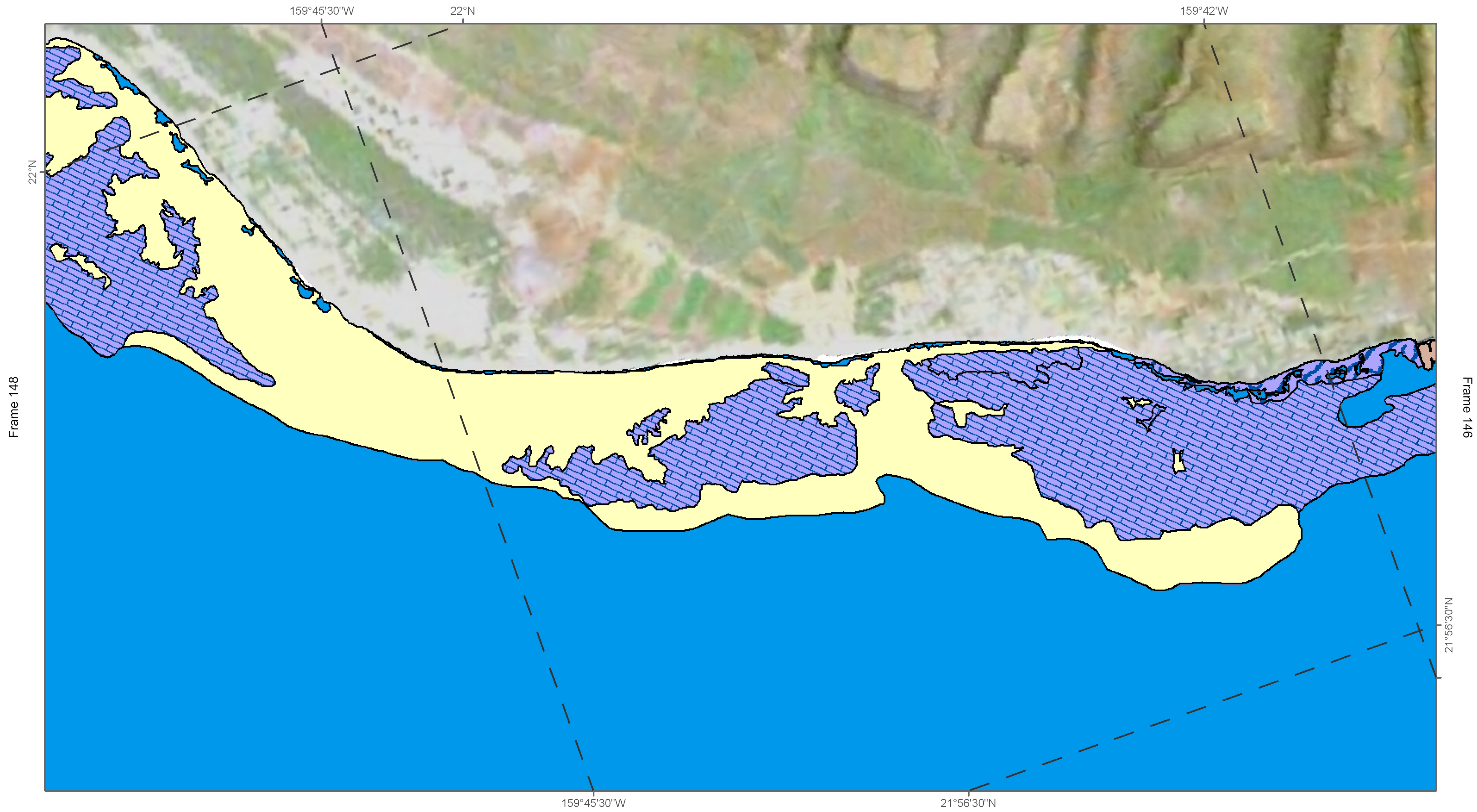
□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 147)


159°45'30"W
22°N
159°42'W
22°N
Frame 148
Frame 146
21°56'30"N
159°45'30"W
21°56'30"N
0 0.5 1 1.5 km
1 0.5 0 mi

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Kauai
135
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147
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142
145
144
143
0 5 10 km
0 50 100 km
N
W
E
S

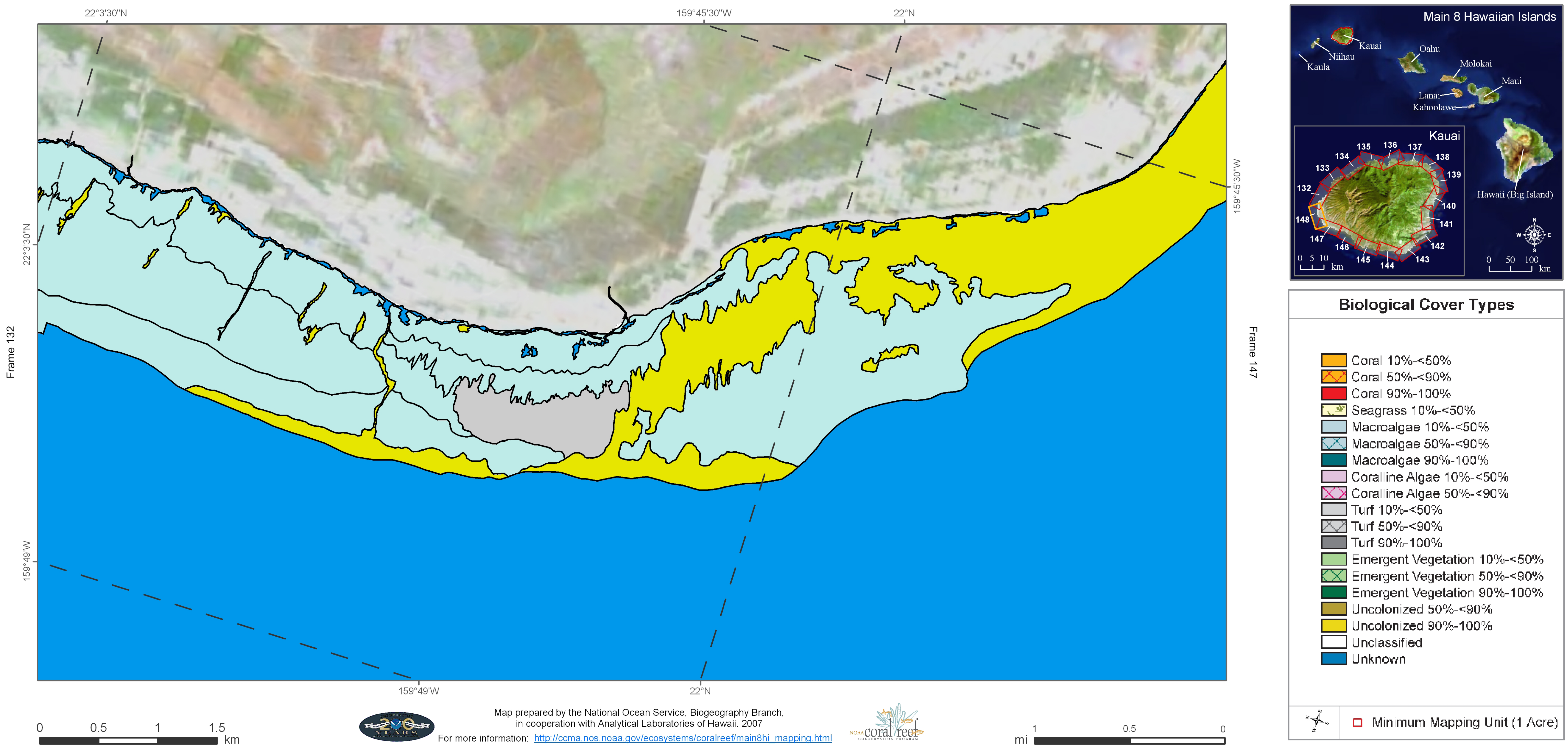
Geomorphological Structure Types

- Aggregate Reef
- Aggregated Patch Reef
- Individual Patch Reef
- Scattered Coral/Rock
- Spur and Groove
- Pavement
- Pavement with Sand Channels
- Rock/Boulder
- Rubble
- Artificial
- Mud
- Sand
- Unknown

☐ Minimum Mapping Unit (1 Acre)

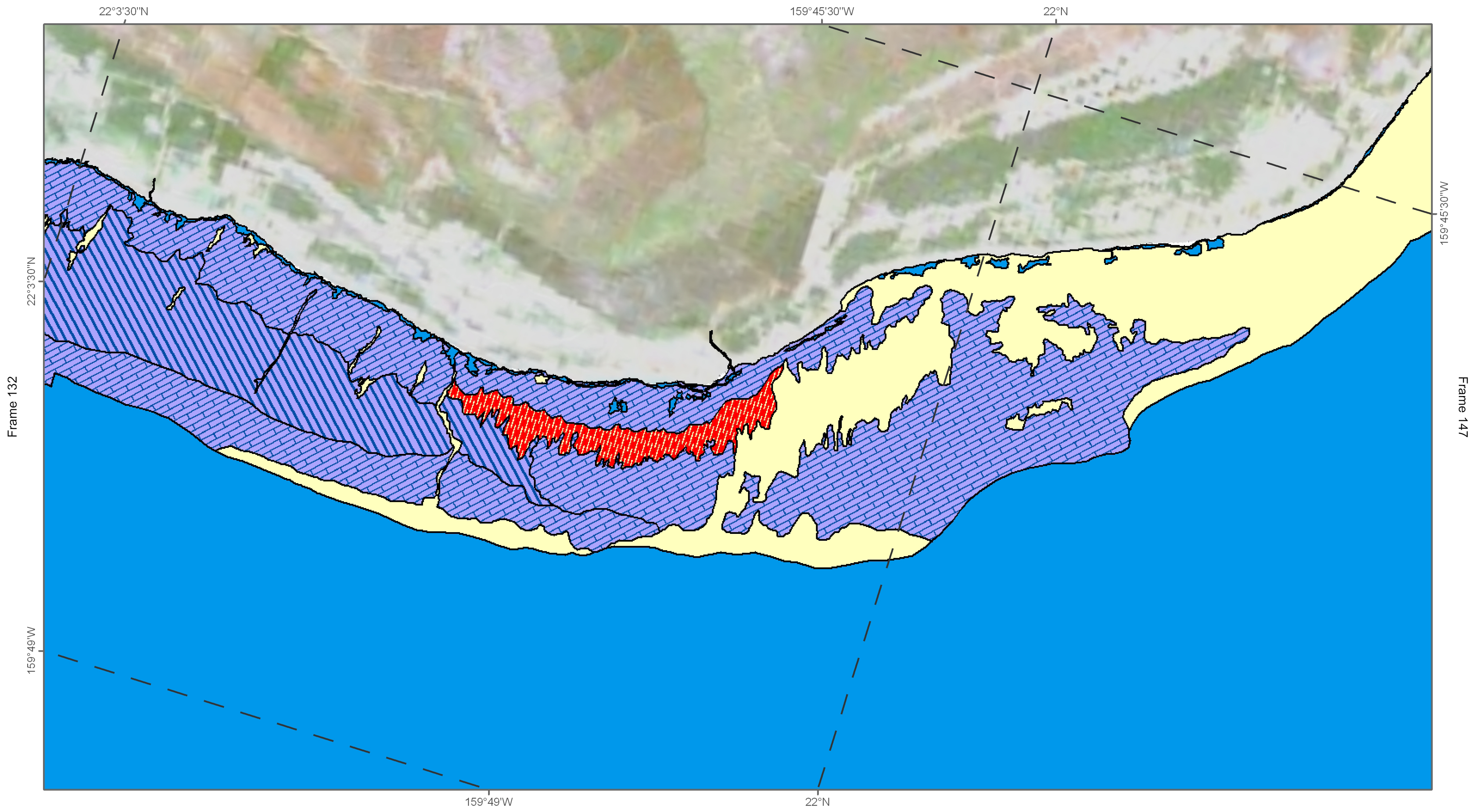
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 148)


22°3'30"N
159°45'30"W
22°N
22°3'30"N
159°49'W
Frame 132
159°45'30"W
Frame 147
159°49'W
22°N
0
0.5
1
1.5
km
1
0.5
0
mi
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0
50
100
km
Kauai
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
0 5 10
km
N
W
E
S
Biological Cover Types
Coral 10%-<50%
Coral 50%-<90%
Coral 90%-100%
Seagrass 10%-<50%
Macroalgae 10%-<50%
Macroalgae 50%-<90%
Macroalgae 90%-100%
Coralline Algae 10%-<50%
Coralline Algae 50%-<90%
Turf 10%-<50%
Turf 50%-<90%
Turf 90%-100%
Emergent Vegetation 10%-<50%
Emergent Vegetation 50%-<90%
Emergent Vegetation 90%-100%
Uncolonized 50%-<90%
Uncolonized 90%-100%
Unclassified
Unknown
Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Kauai) : Shallow-water Benthic Habitats (Frame 148)


22°3'30"N
159°45'30"W
22°N
22°3'30"N
159°49'W
Frame 132
159°45'30"W
Frame 147
159°49'W
22°N

Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Kauai
135
136
137
134
138
133
139
132
140
148
141
147
146
142
145
144
143
0 5 10
km
Hawaii (Big Island)
N
W
E
S
0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

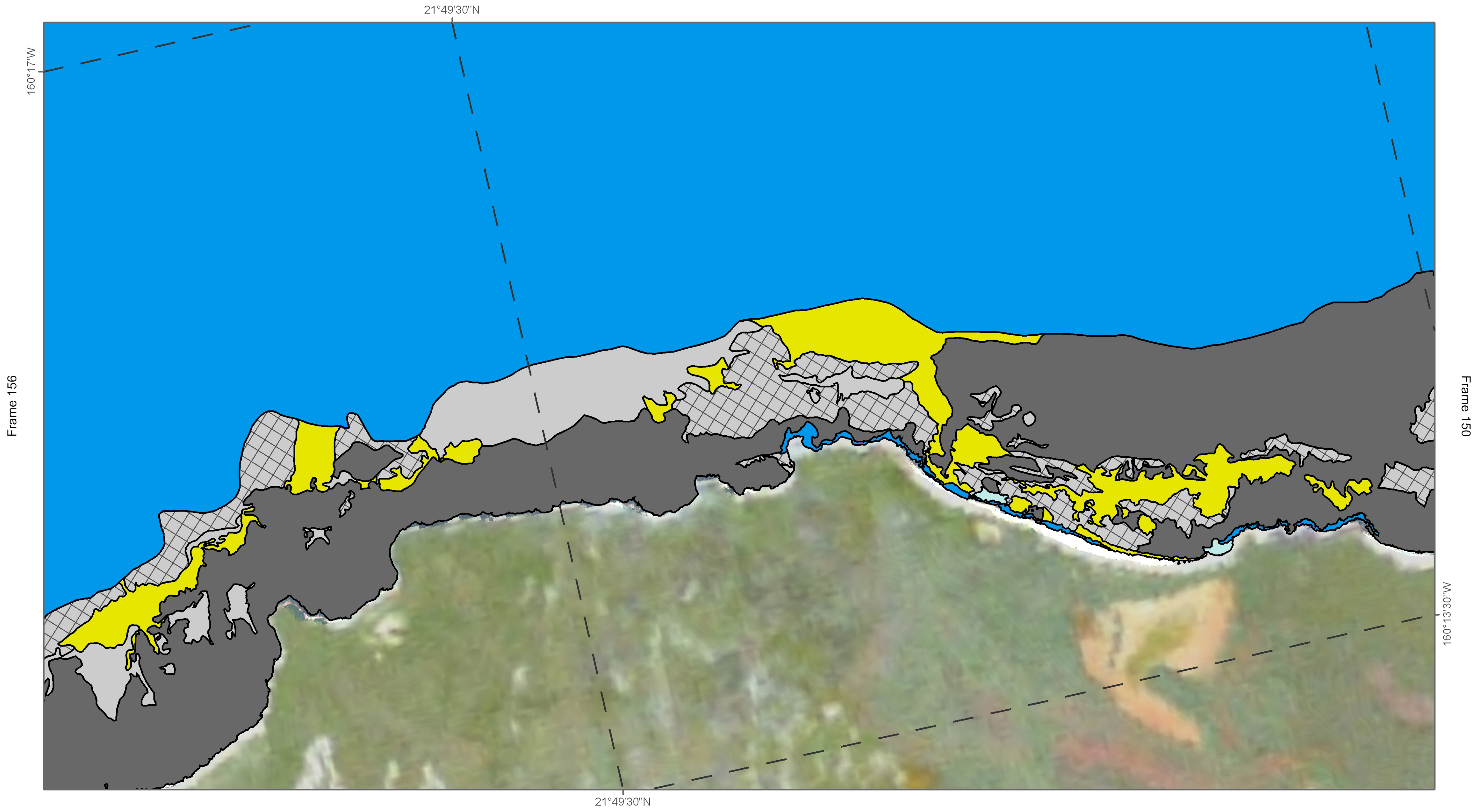
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

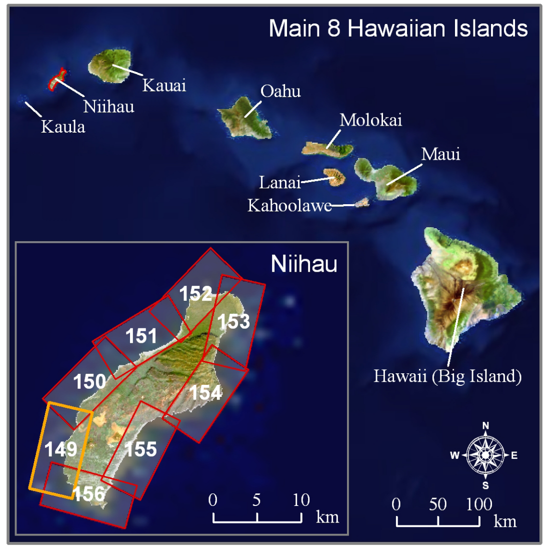
Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 149)


21°49'30"N
160°17'W
Frame 156
Frame 150
160°13'30"W
21°49'30"N

0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Niihau
152
153
151
150
154
149
155
156
0 5 10
km
0 50 100
km
N
W
E
S

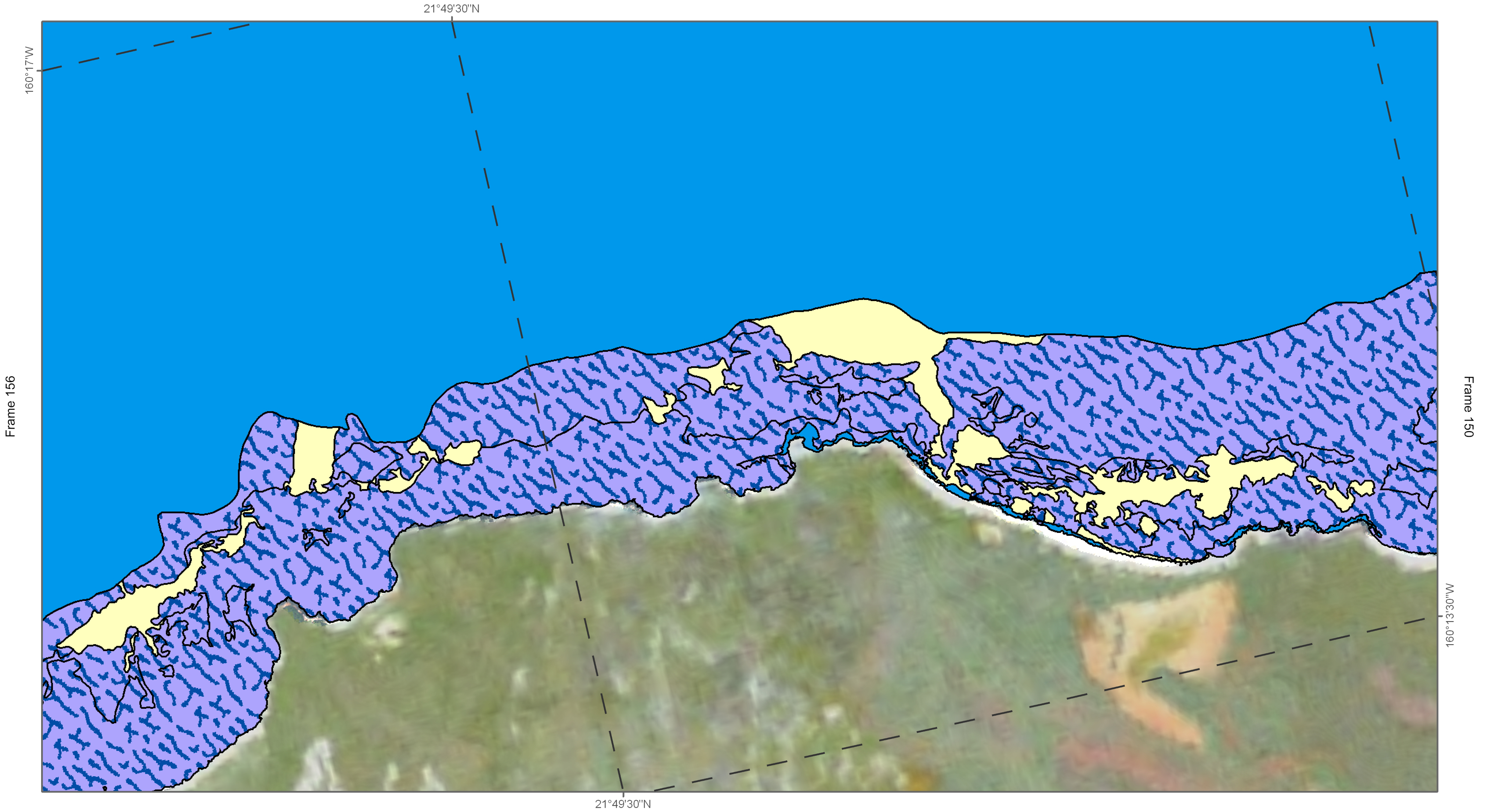
Biological Cover Types

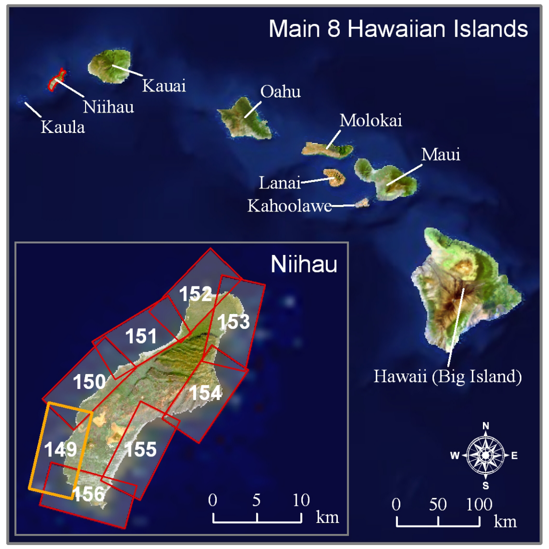
- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- 🟦 Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 149)


21°49'30"N
160°17'W
Frame 156
Frame 150
160°13'30"W
21°49'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Niihau
152
153
151
150
154
149
155
156
0 5 10 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

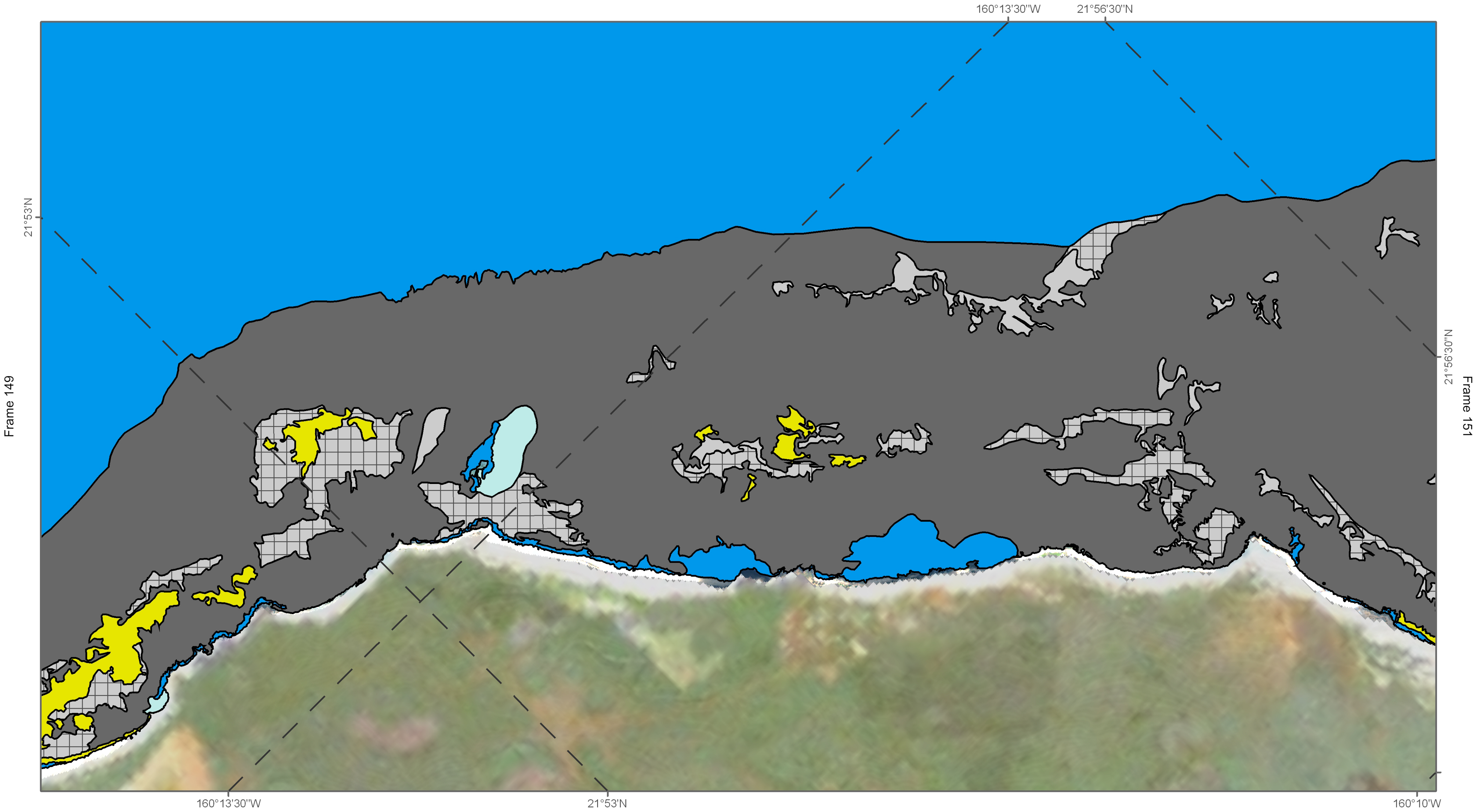
□ Minimum Mapping Unit (1 Acre)

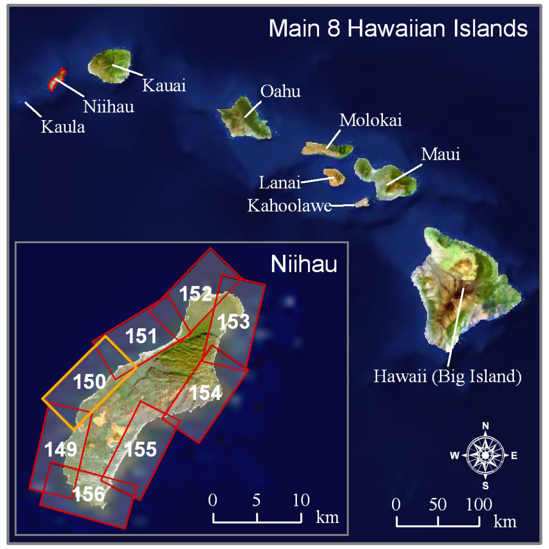
0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 150)


160°13'30"W
21°56'30"N
21°53'N
Frame 149
21°56'30"N
Frame 151
160°13'30"W
21°53'N
160°10'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Niihau
152
153
151
150
154
149
155
156
0 5 10 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ⬜ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- 🟦 Macroalgae 90%-100%
- ⬜ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

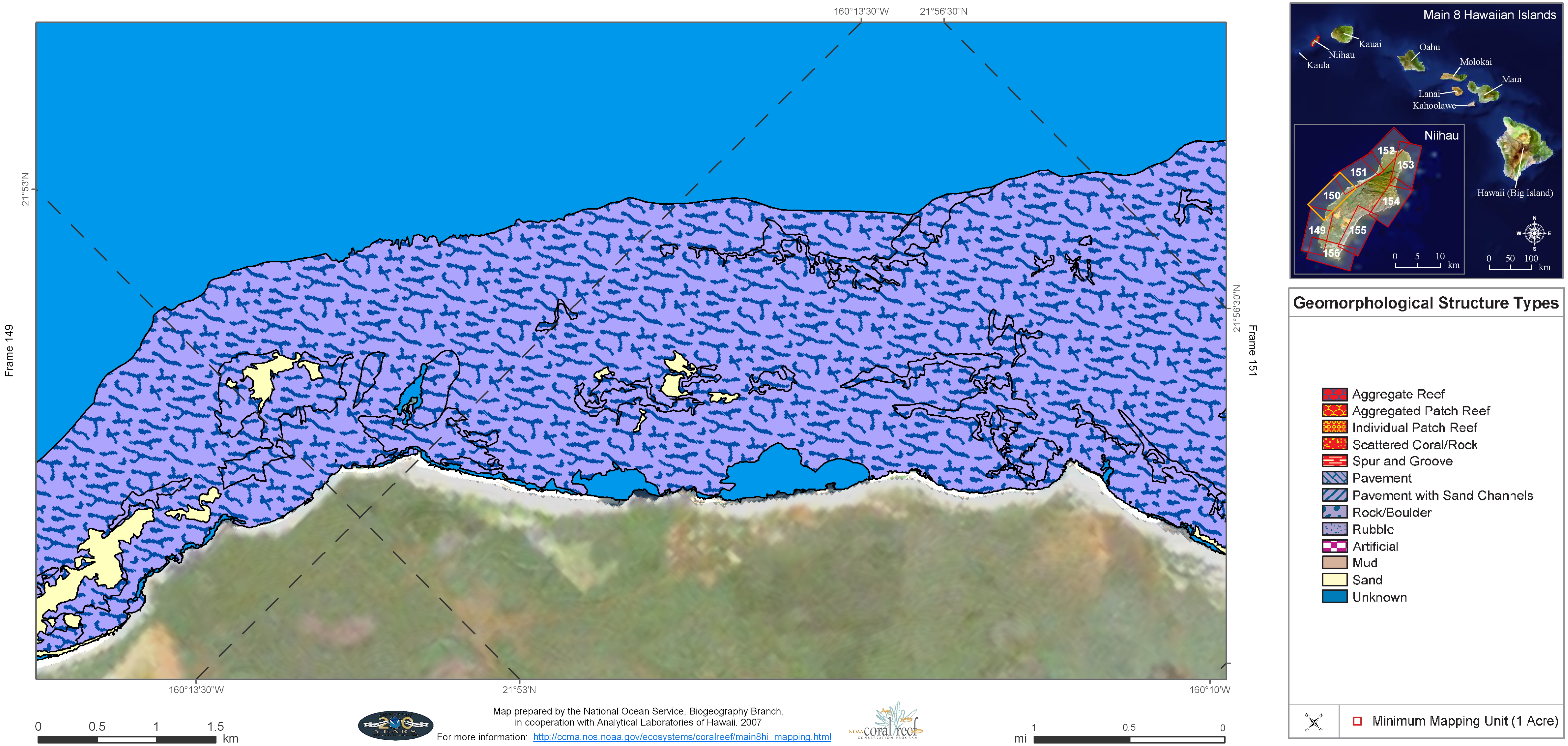
☐ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 150)


160°13'30"W
21°56'30"N
21°53'N
Frame 149
21°56'30"N
Frame 151
160°13'30"W
21°53'N
160°10'W
Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Niihau
152
153
151
150
154
149
155
156
0 5 10 km
0 50 100 km
N
W
E
S
0 0.5 1 1.5 km
1 0.5 0 mi

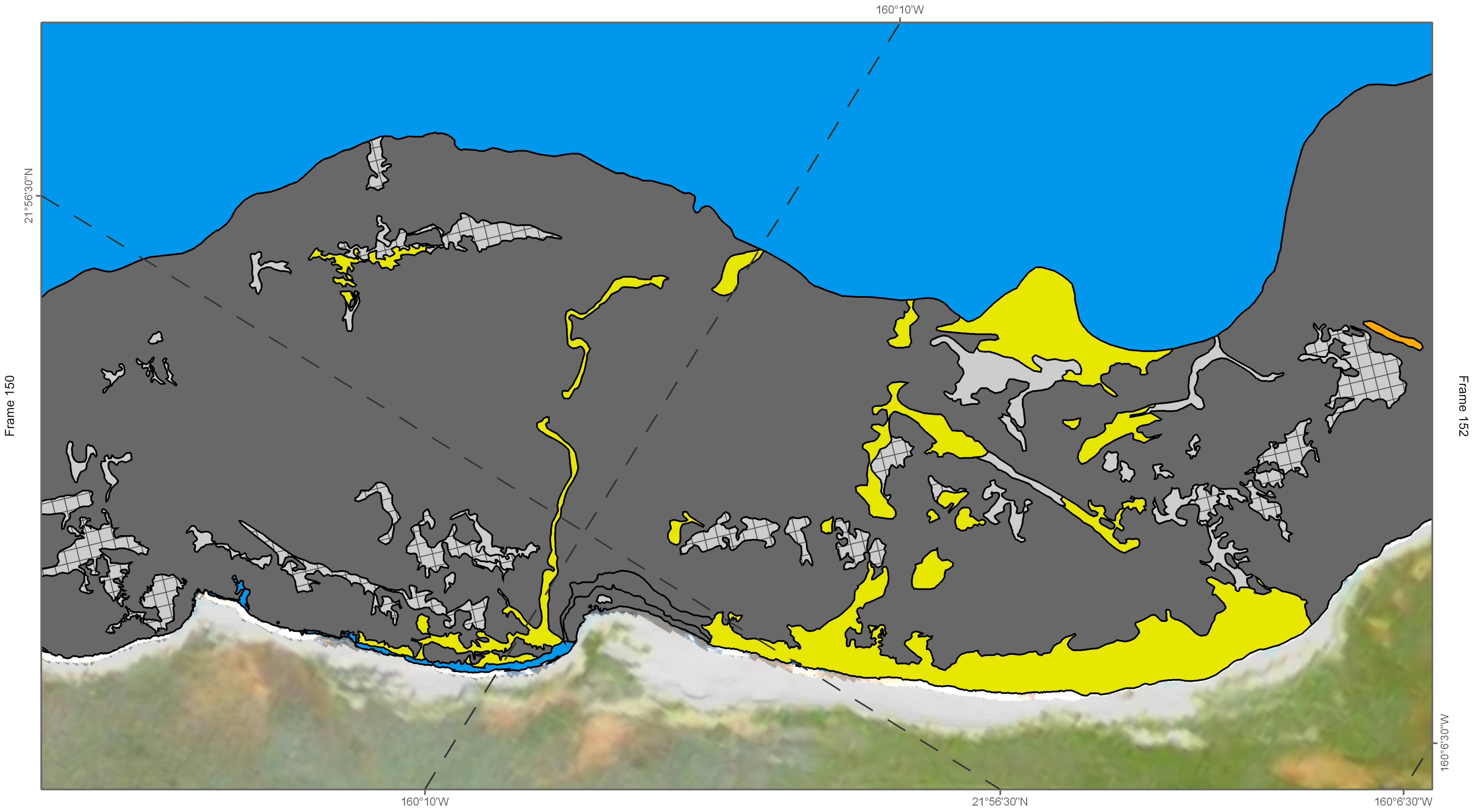
Geomorphological Structure Types

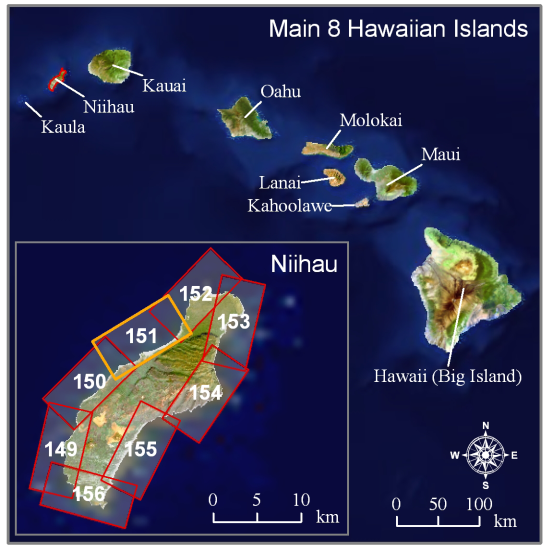
- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

□ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 151)


160°10'W
21°56'30"N
Frame 150
Frame 152
160°10'W
21°56'30"N
160°6'30"W
160°6'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
0 50 100
km
Niihau
152
153
151
150
154
149
155
156
0 5 10
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

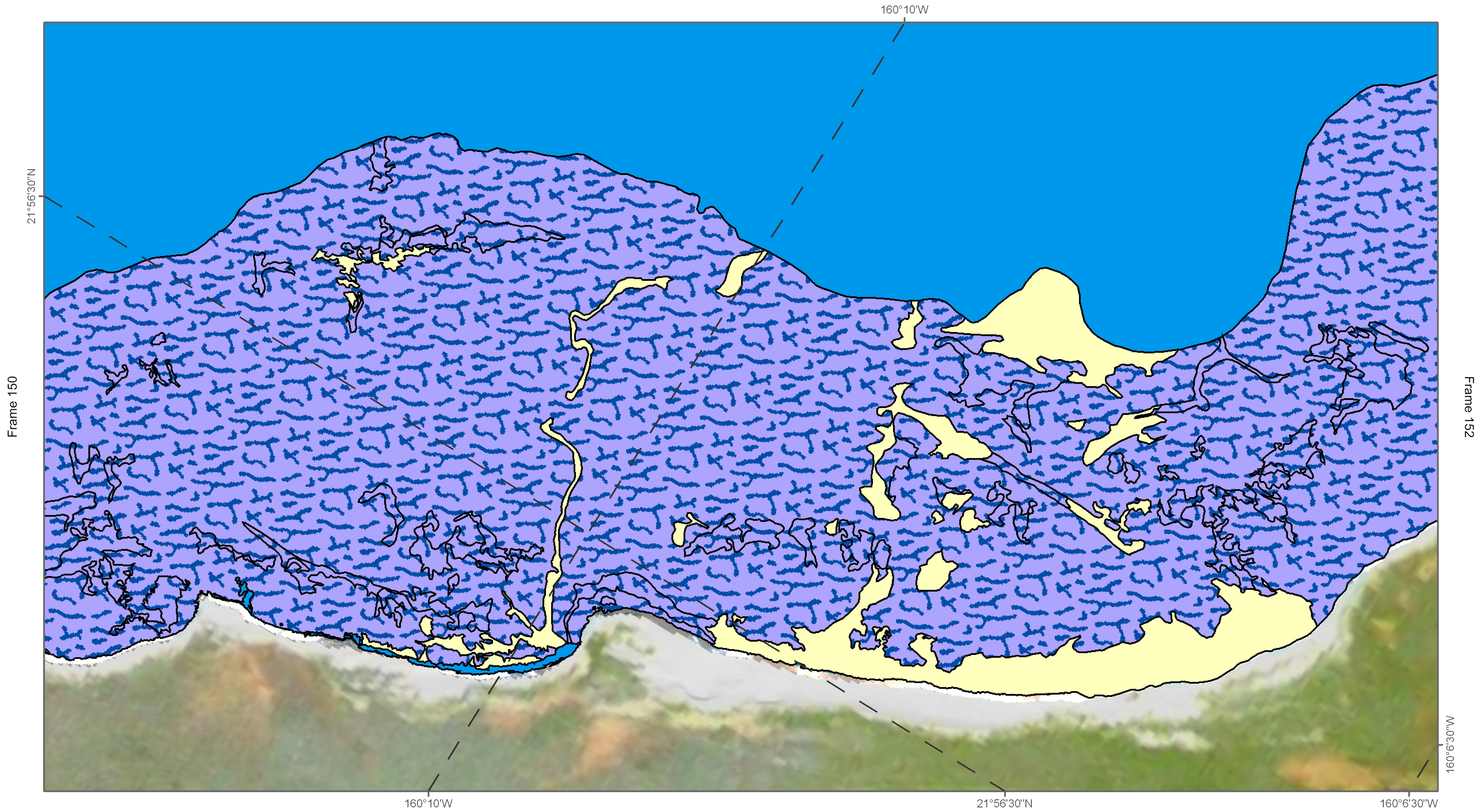
☐ Minimum Mapping Unit (1 Acre)

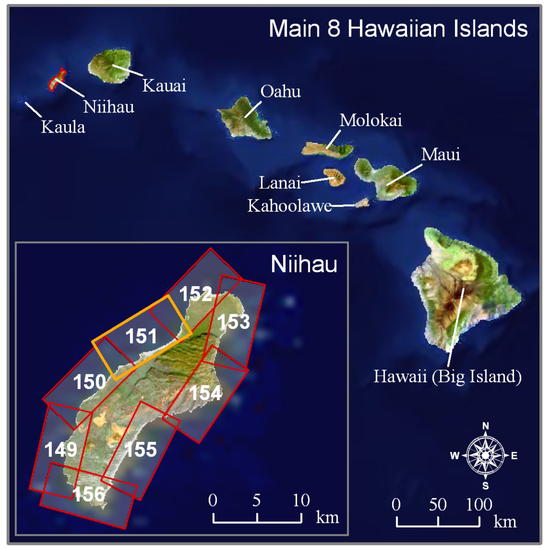
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 151)


160°10'W
21°56'30"N
Frame 150
Frame 152
160°6'30"W
160°10'W
21°56'30"N
160°6'30"W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Niihau
152
153
151
150
154
149
155
156
0 5 10 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ▨ Mud
- ▨ Sand
- ▨ Unknown

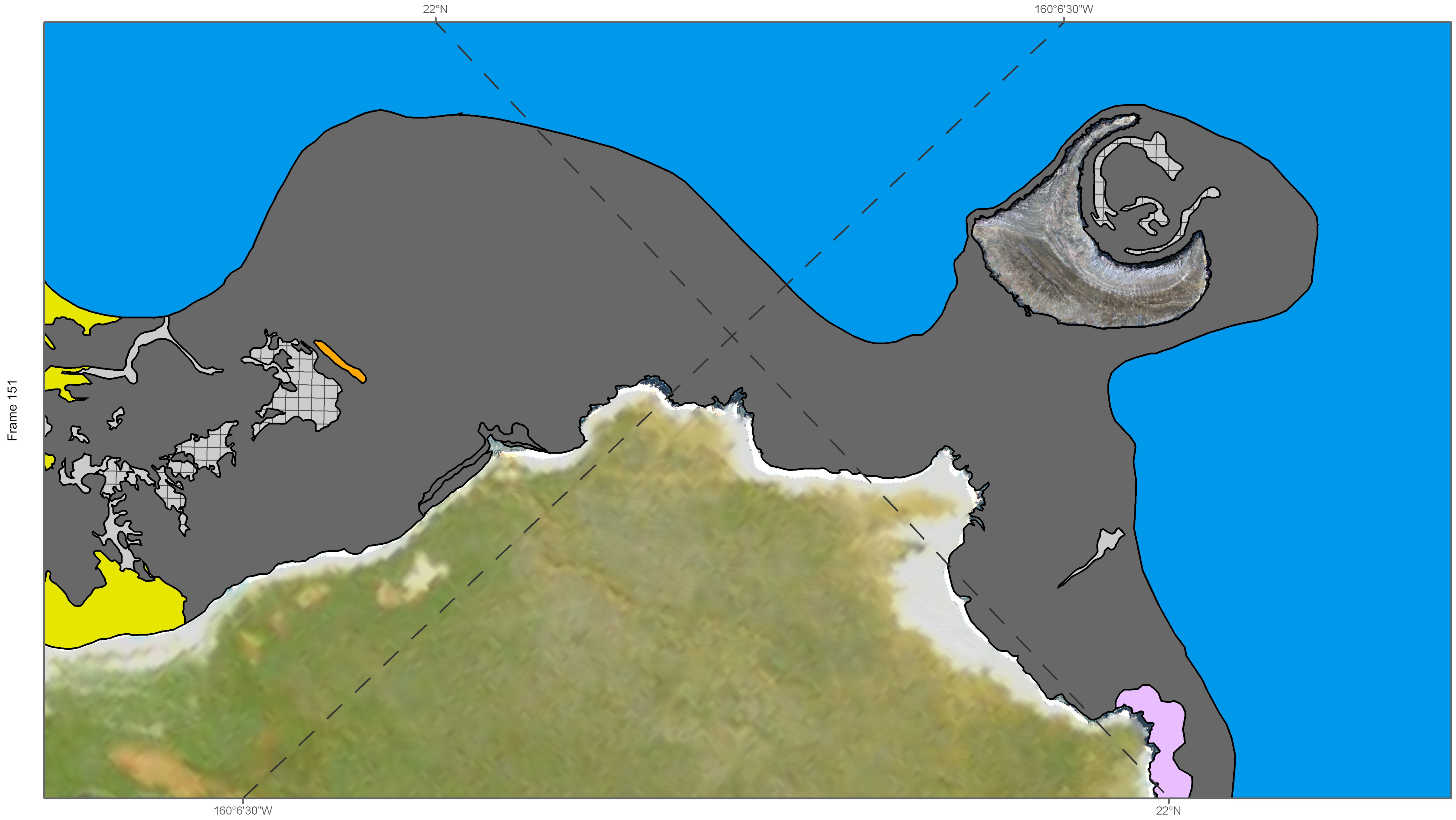
□ Minimum Mapping Unit (1 Acre)

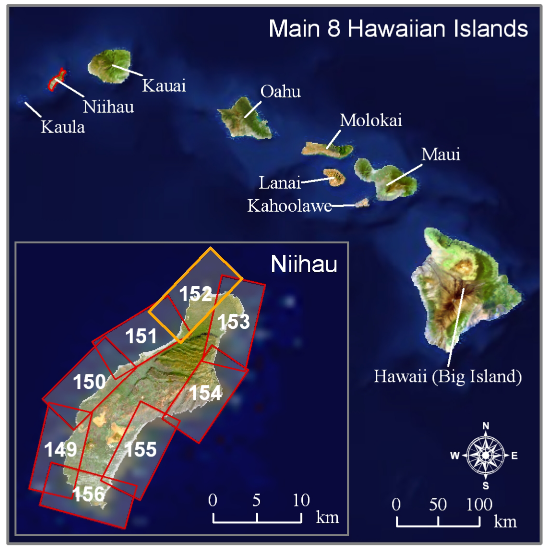
0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 152)


22°N
160°6'30"W
Frame 151
160°6'30"W
22°N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Niihau
152
153
151
150
154
149
155
156
0 5 10 km
Hawaii (Big Island)
N
W
E
S
0 50 100 km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- □ Unclassified
- 🟦 Unknown

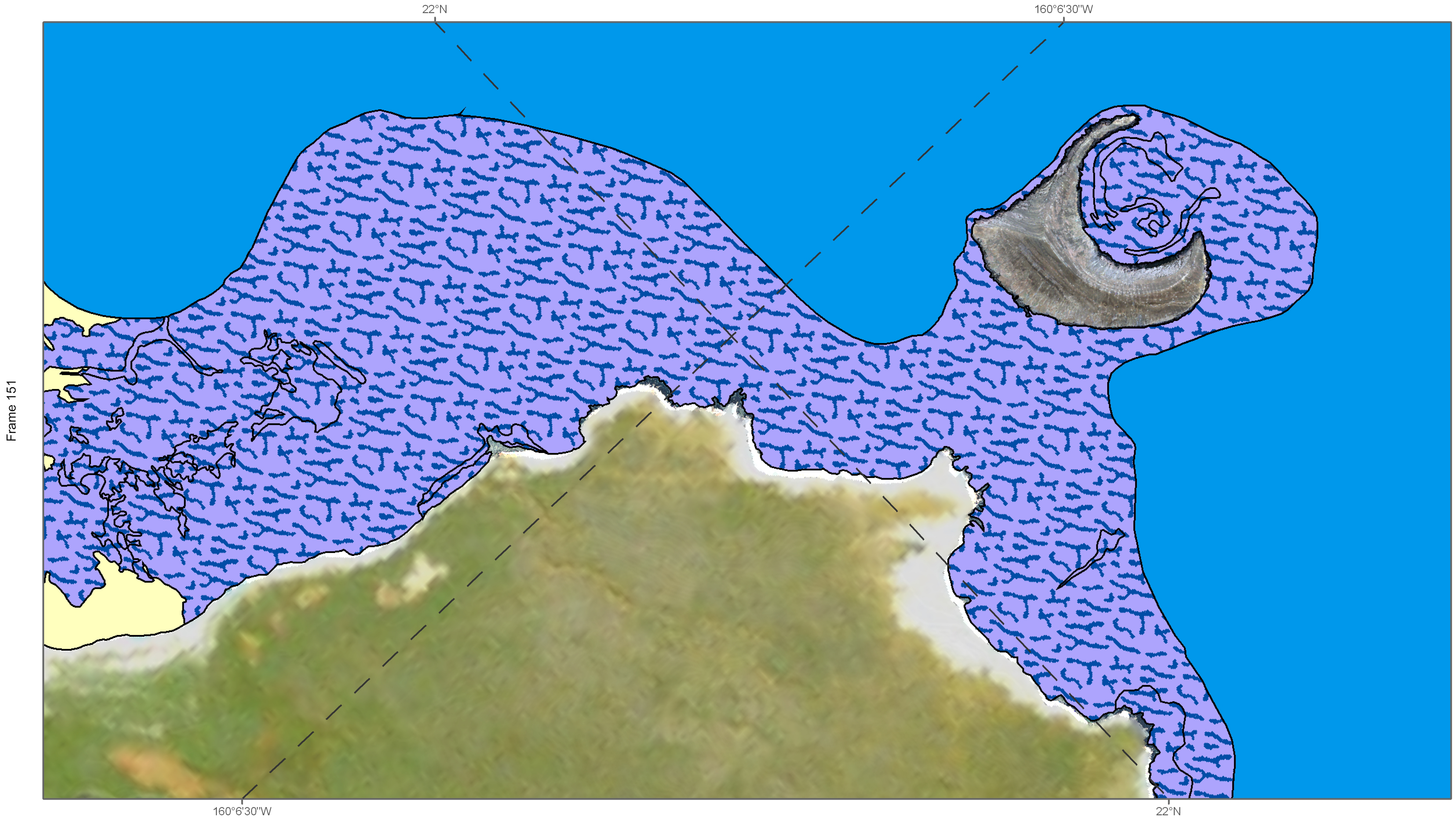
□ Minimum Mapping Unit (1 Acre)

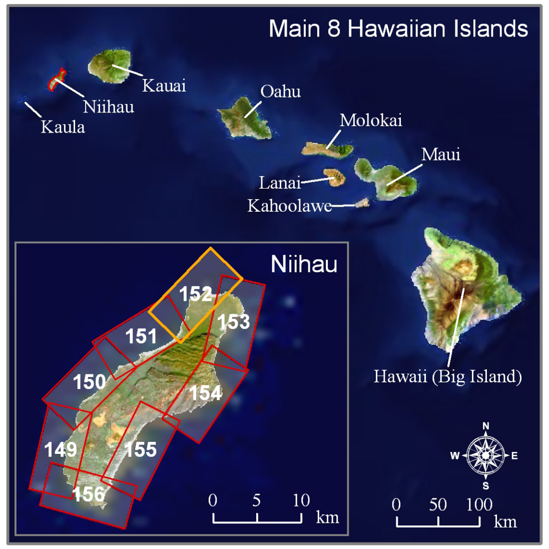
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 152)


22°N
160°6'30"W
Frame 151
160°6'30"W
22°N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Niihau
152
153
151
150
154
149
155
156
0 5 10 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

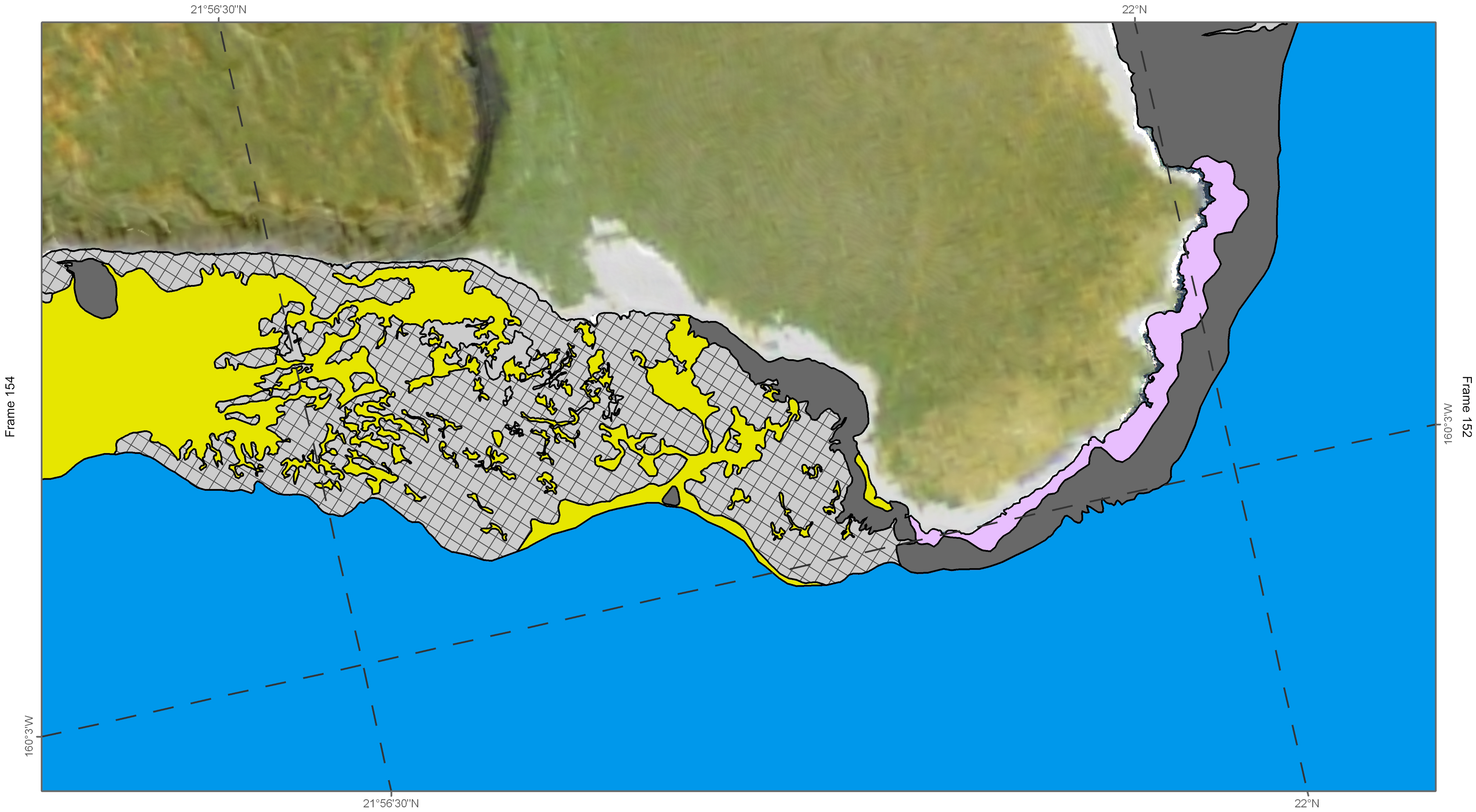
☐ Minimum Mapping Unit (1 Acre)

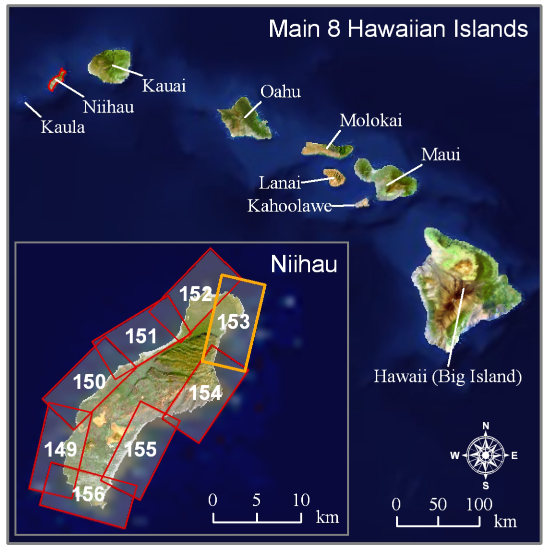
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 153)


21°56'30"N
22°N
Frame 154
Frame 152
160°3'W
160°3'W
21°56'30"N
22°N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Niihau
152
153
151
150
154
149
155
156
0
5
10
km
0
50
100
km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- 🟦 Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- 🟦 Macroalgae 90%-100%
- 🟪 Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

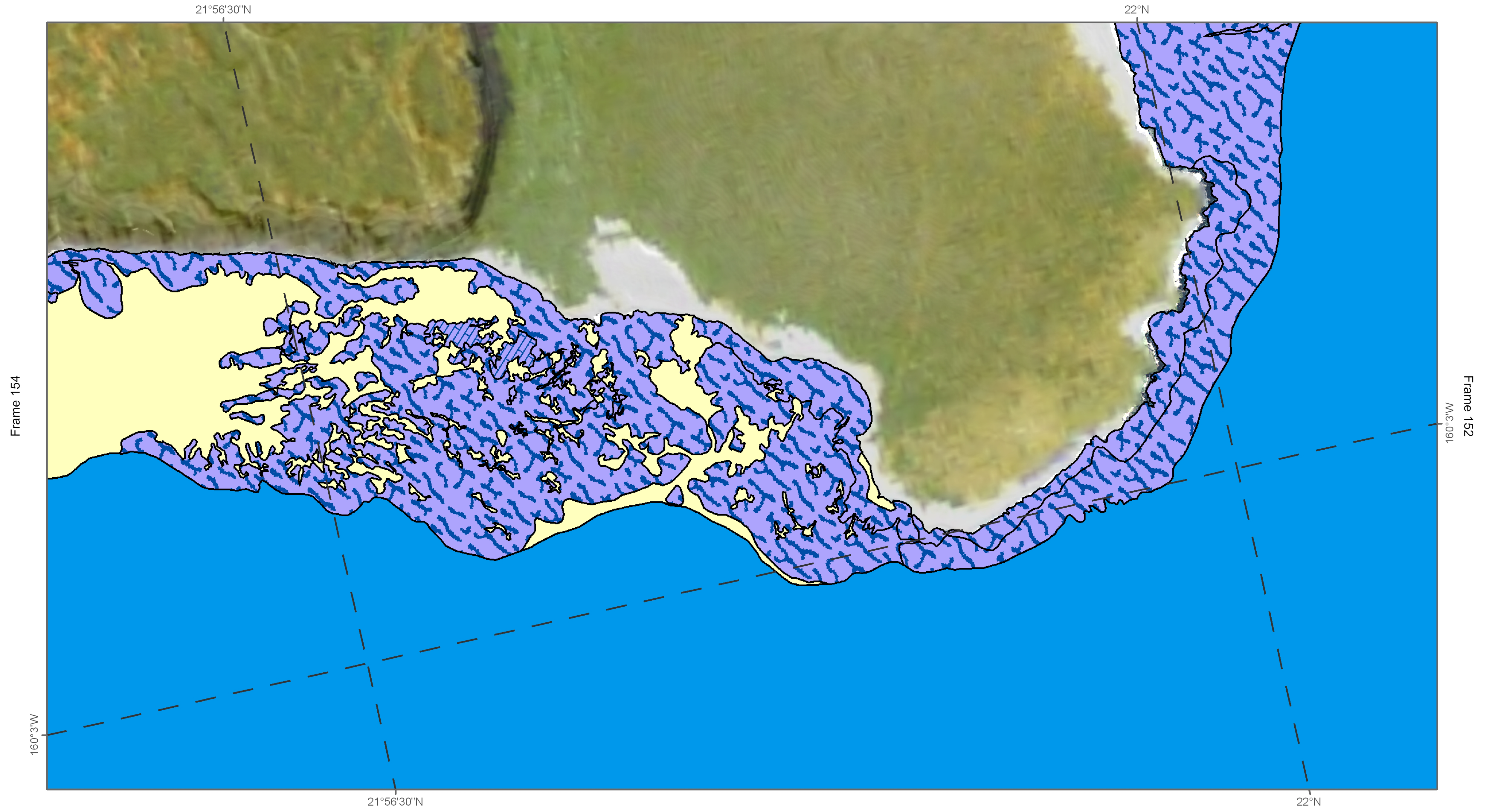
□ Minimum Mapping Unit (1 Acre)

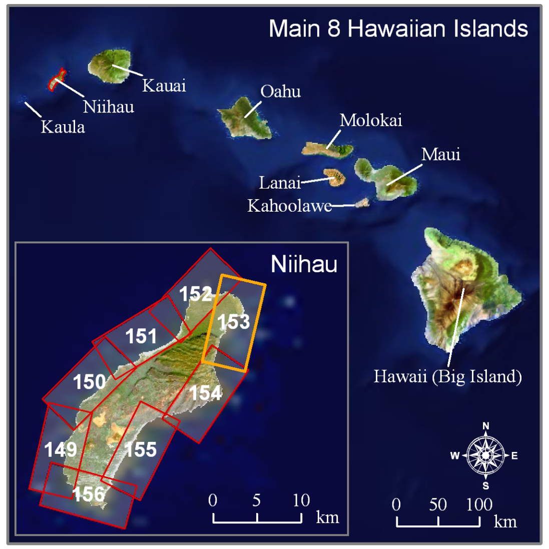
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 153)


21°56'30"N
22°N
Frame 154
Frame 152
160°3'W
160°3'W
21°56'30"N
22°N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Niihau
152
153
151
150
154
149
155
156
0 5 10 km
0 50 100 km
N
W
E
S

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- 🟪 Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

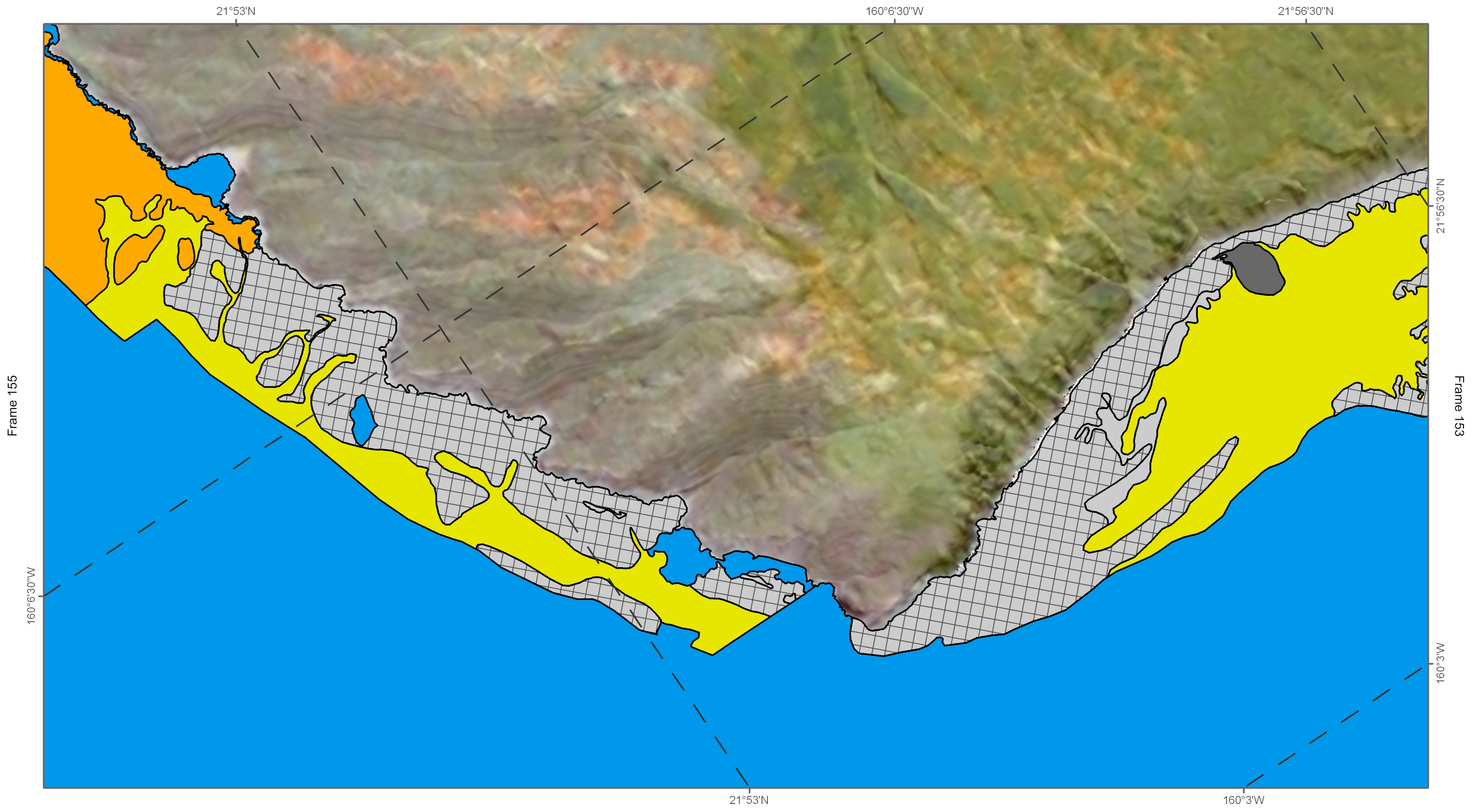
□ Minimum Mapping Unit (1 Acre)

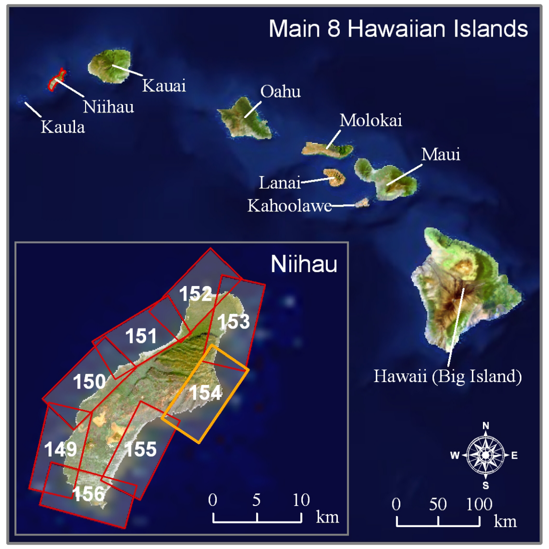
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 154)


21°53'N
160°6'30"W
21°56'30"N
Frame 155
160°6'30"W
21°56'30"N
Frame 153
160°3'W
21°53'N
160°3'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Niihau
152
151
153
150
154
149
155
156
0 5 10
km
Hawaii (Big Island)
N
W
E
S
0 50 100
km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- 🟦 Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- 🟦 Macroalgae 90%-100%
- 🟪 Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ⬜ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ⬛ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ⬜ Unclassified
- 🟦 Unknown

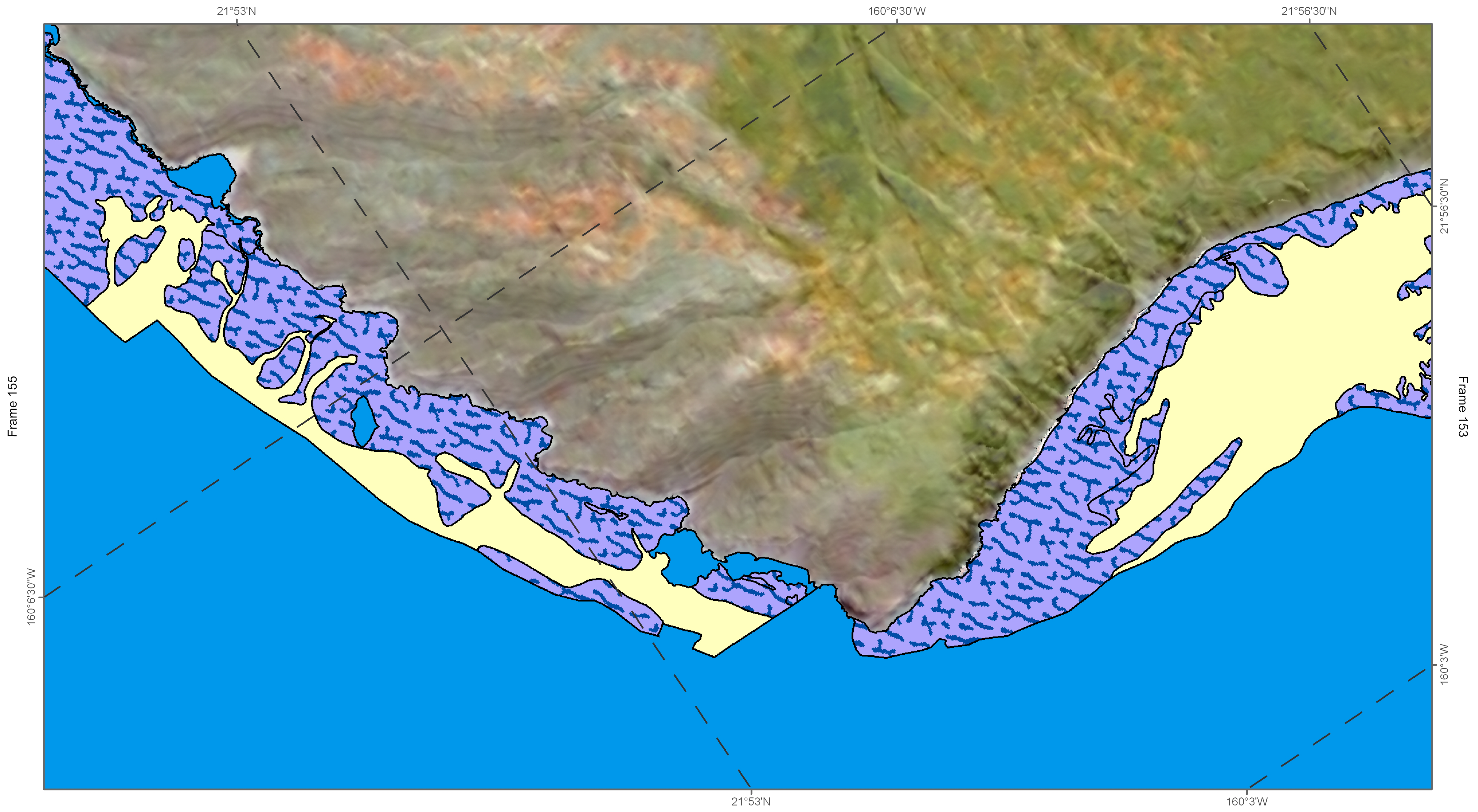
□ Minimum Mapping Unit (1 Acre)

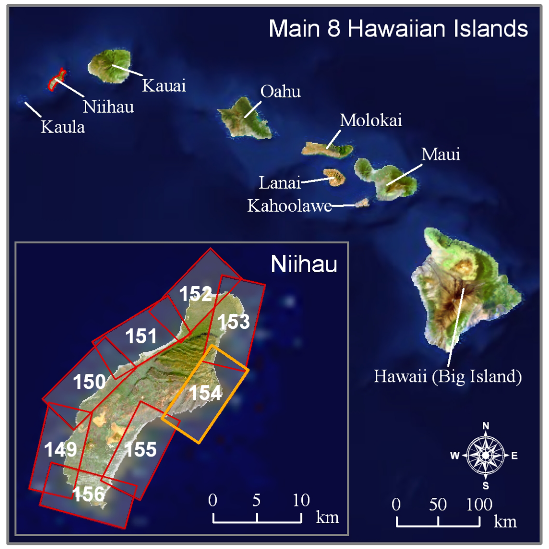
0 0.5 1 1.5
km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0
mi

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 154)


21°53'N
160°6'30"W
21°56'30"N
Frame 155
160°6'30"W
21°56'30"N
Frame 153
160°3'W
21°53'N
160°3'W
0
0.5
1
1.5
km
1
0.5
0
mi


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Niihau
152
153
151
150
154
149
155
156
0
5
10
km
0
50
100
km
N
W
E
S

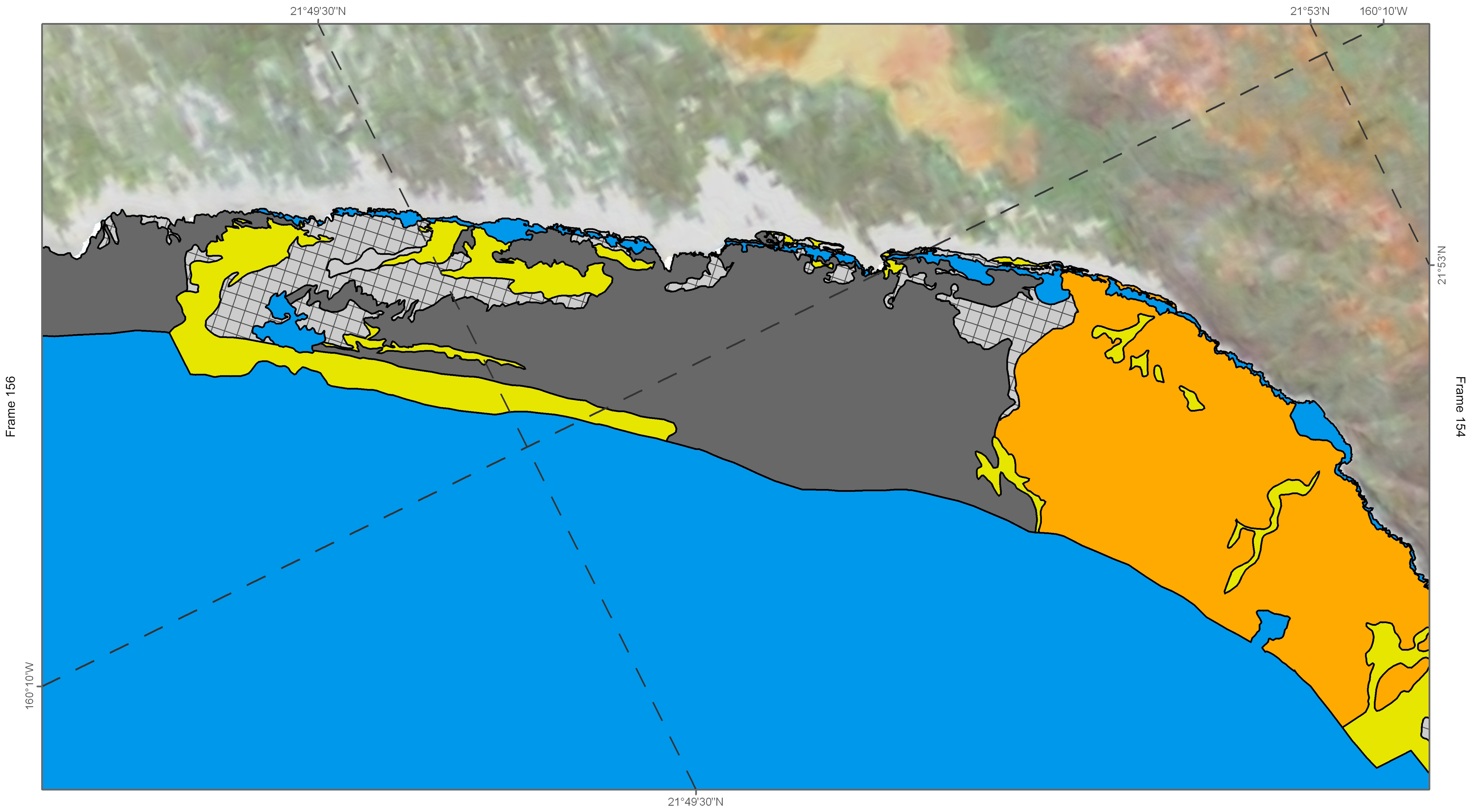
Geomorphological Structure Types

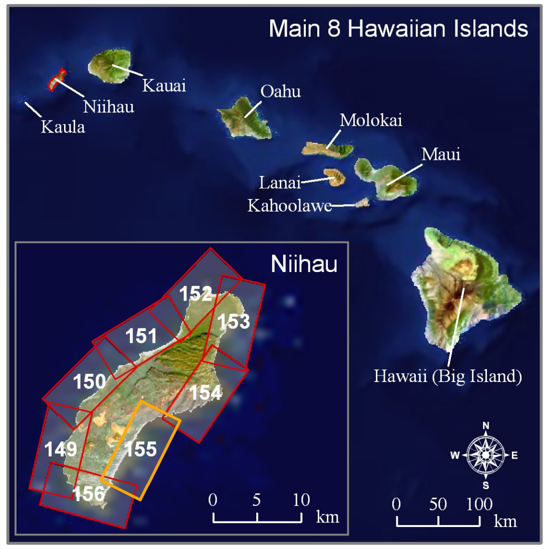
- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟧 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▩ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

☐ Minimum Mapping Unit (1 Acre)

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 155)


21°49'30"N
21°53'N
160°10'W
21°53'N
Frame 154
Frame 156
160°10'W
21°49'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Niihau
152
153
151
150
154
149
155
156
0 5 10 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ■ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ■ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ■ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- ■ Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

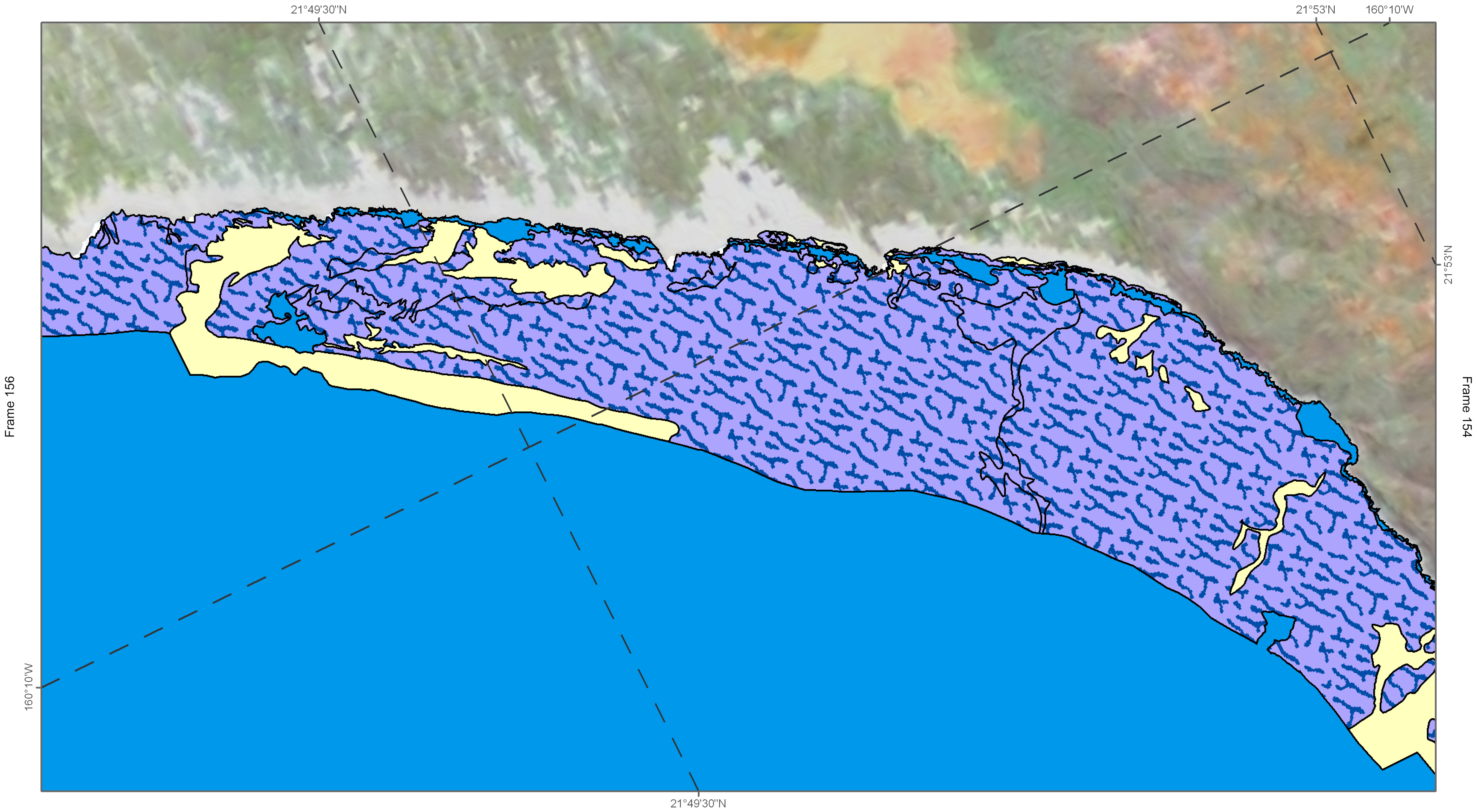
☐ Minimum Mapping Unit (1 Acre)

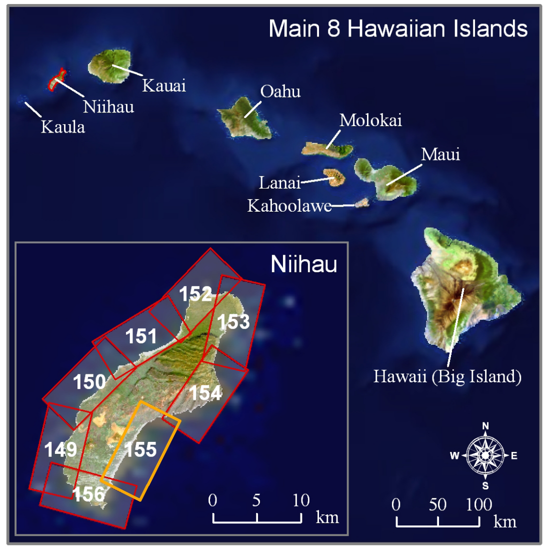
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 155)


21°49'30"N
21°53'N
160°10'W
21°53'N
Frame 156
Frame 154
160°10'W
21°49'30"N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Niihau
152
153
151
150
154
149
155
156
0 5 10 km
Hawaii (Big Island)
N
W
E
S
0 50 100 km

Geomorphological Structure Types

- ▨ Aggregate Reef
- ▨ Aggregated Patch Reef
- ▨ Individual Patch Reef
- ▨ Scattered Coral/Rock
- ▨ Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- ■ Mud
- ■ Sand
- ■ Unknown

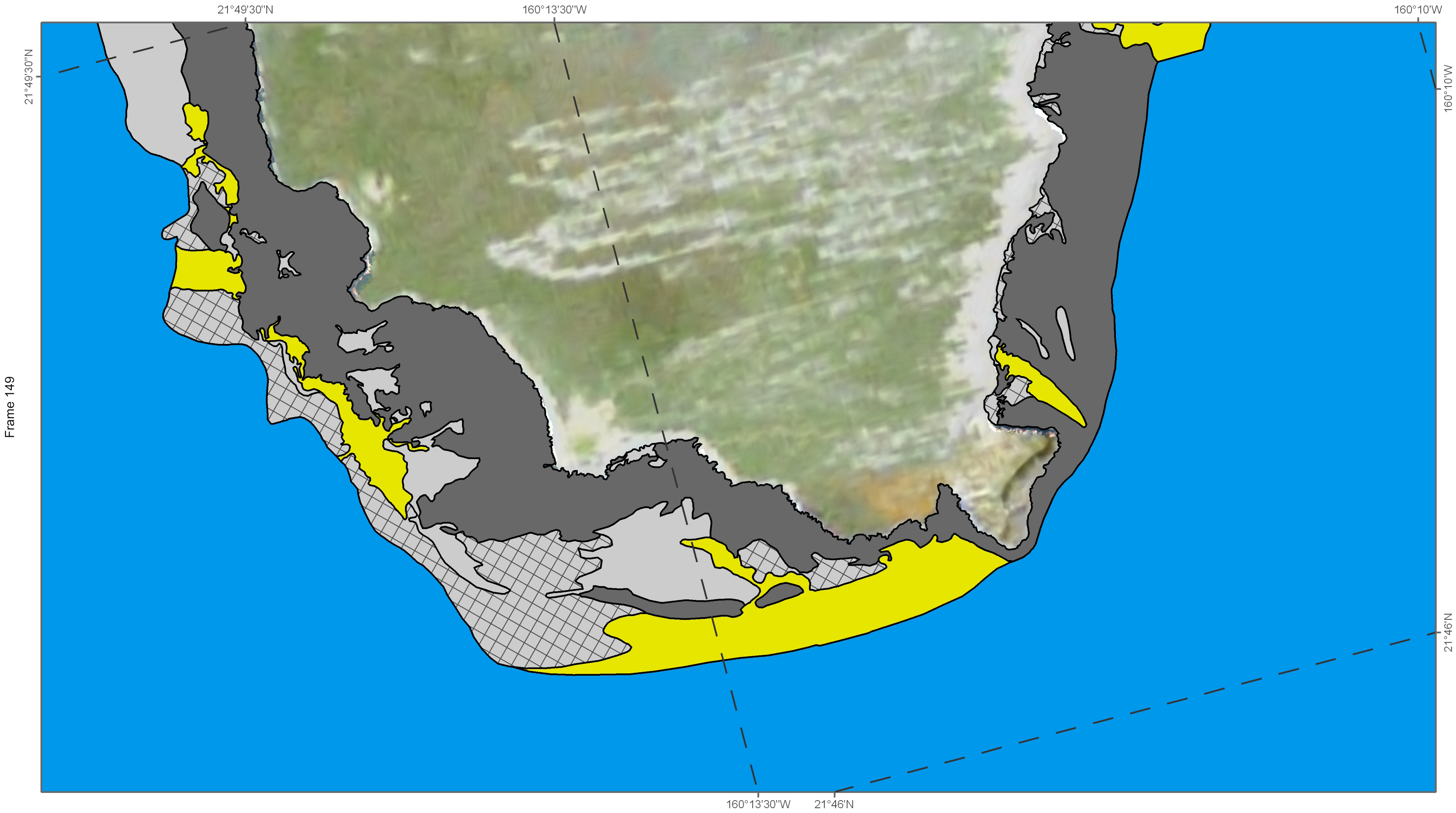
□ Minimum Mapping Unit (1 Acre)

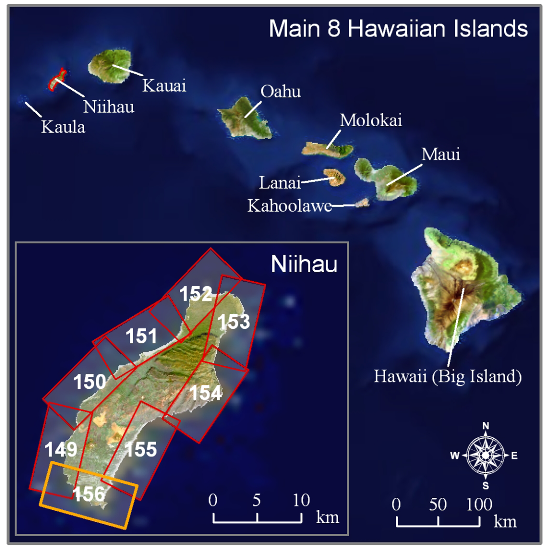
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 156)


21°49'30"N
160°13'30"W
160°10'W
21°49'30"N
160°10'W
Frame 149
21°46'N
160°13'30"W
21°46'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Niihau
152
153
151
150
154
149
155
156
0 5 10 km
0 50 100 km
N
W
E
S

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ☐ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ☐ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ☐ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

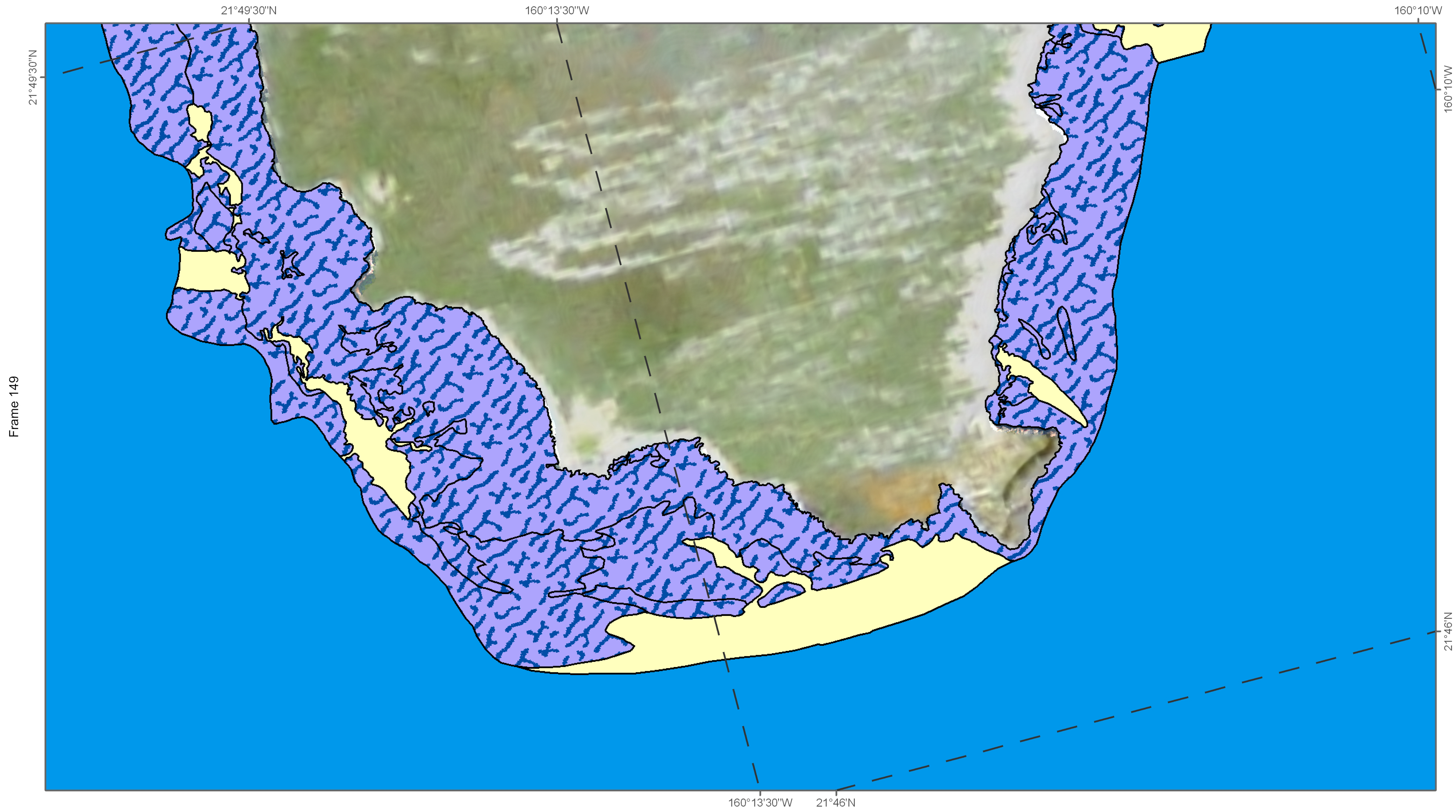
□ Minimum Mapping Unit (1 Acre)

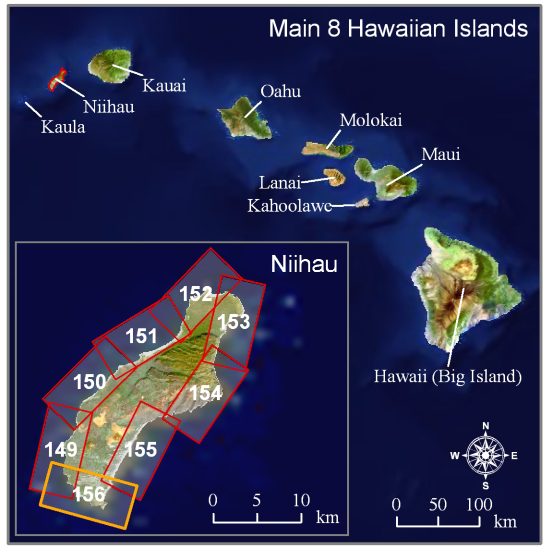
0 0.5 1 1.5 km

1 0.5 0 mi

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

Main 8 Hawaiian Islands (Niihau) : Shallow-water Benthic Habitats (Frame 156)


21°49'30"N
160°13'30"W
160°10'W
21°49'30"N
160°10'W
Frame 149
21°46'N
160°13'30"W
21°46'N


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Niihau
152
153
151
150
154
149
155
156
0 5 10 km
N
W
E
S
0 50 100 km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▦ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

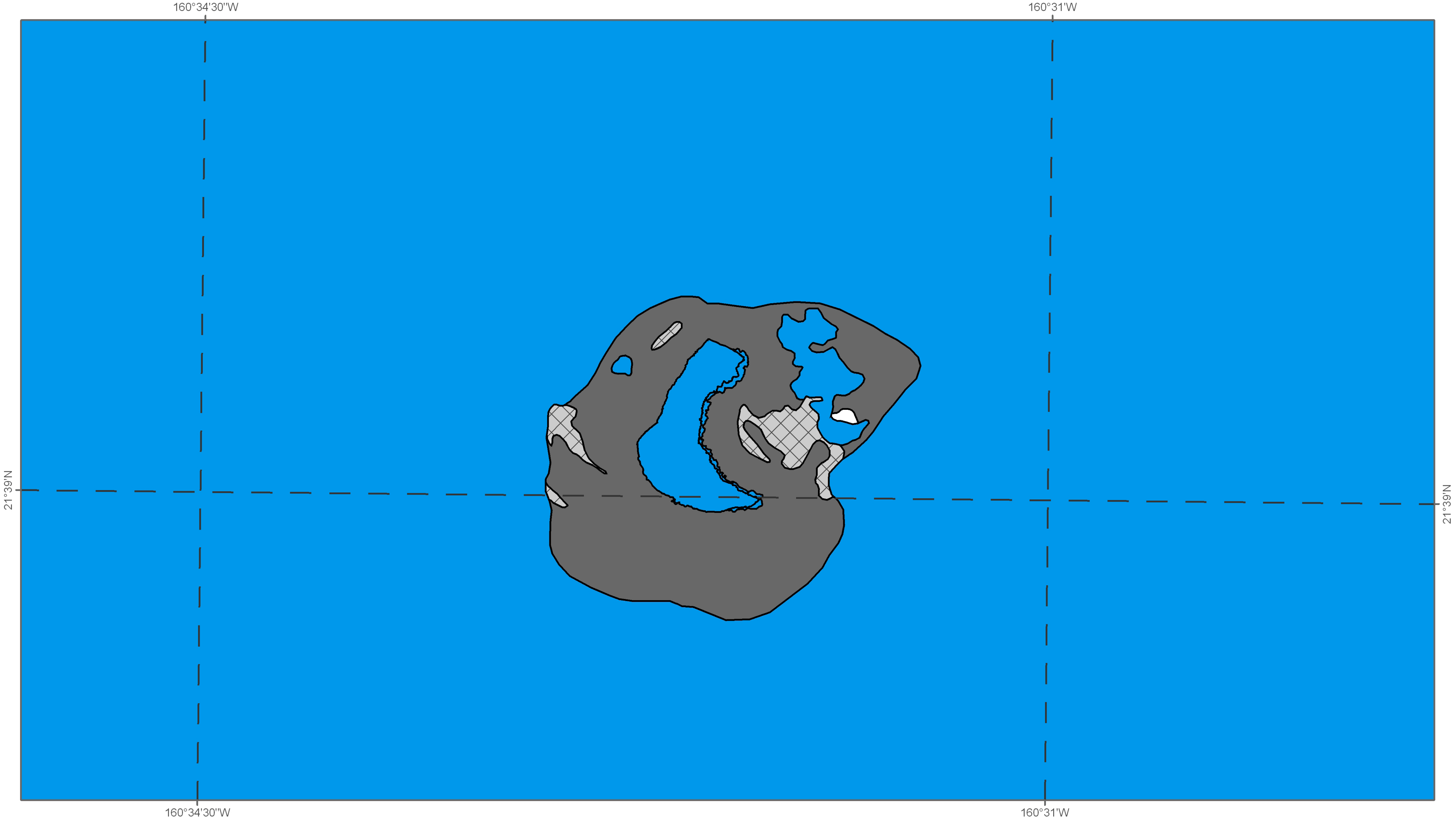
☐ Minimum Mapping Unit (1 Acre)

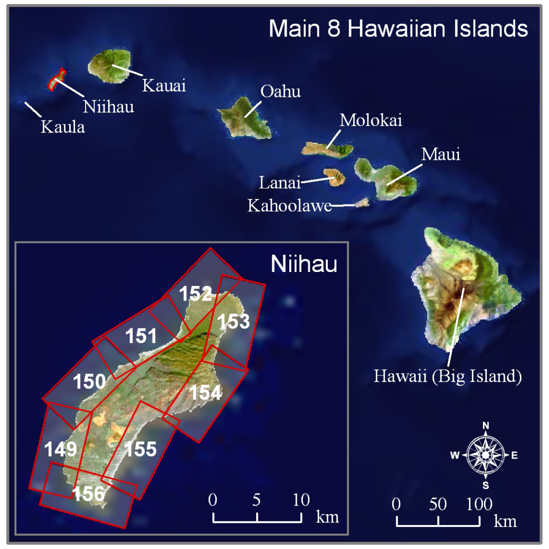
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kaula) : Shallow-water Benthic Habitats (Frame 157)


160°34'30"W
160°31'W
21°39'N
21°39'N
160°34'30"W
160°31'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii (Big Island)
Niihau
152
153
151
150
154
149
155
156
0 5 10 km
0 50 100 km

Biological Cover Types

- 🟧 Coral 10%-<50%
- ▨ Coral 50%-<90%
- 🟥 Coral 90%-100%
- ▨ Seagrass 10%-<50%
- ▢ Macroalgae 10%-<50%
- ▨ Macroalgae 50%-<90%
- ■ Macroalgae 90%-100%
- ▢ Coralline Algae 10%-<50%
- ▨ Coralline Algae 50%-<90%
- ▢ Turf 10%-<50%
- ▨ Turf 50%-<90%
- ■ Turf 90%-100%
- 🟩 Emergent Vegetation 10%-<50%
- ▨ Emergent Vegetation 50%-<90%
- 🟩 Emergent Vegetation 90%-100%
- 🟫 Uncolonized 50%-<90%
- 🟨 Uncolonized 90%-100%
- ☐ Unclassified
- 🟦 Unknown

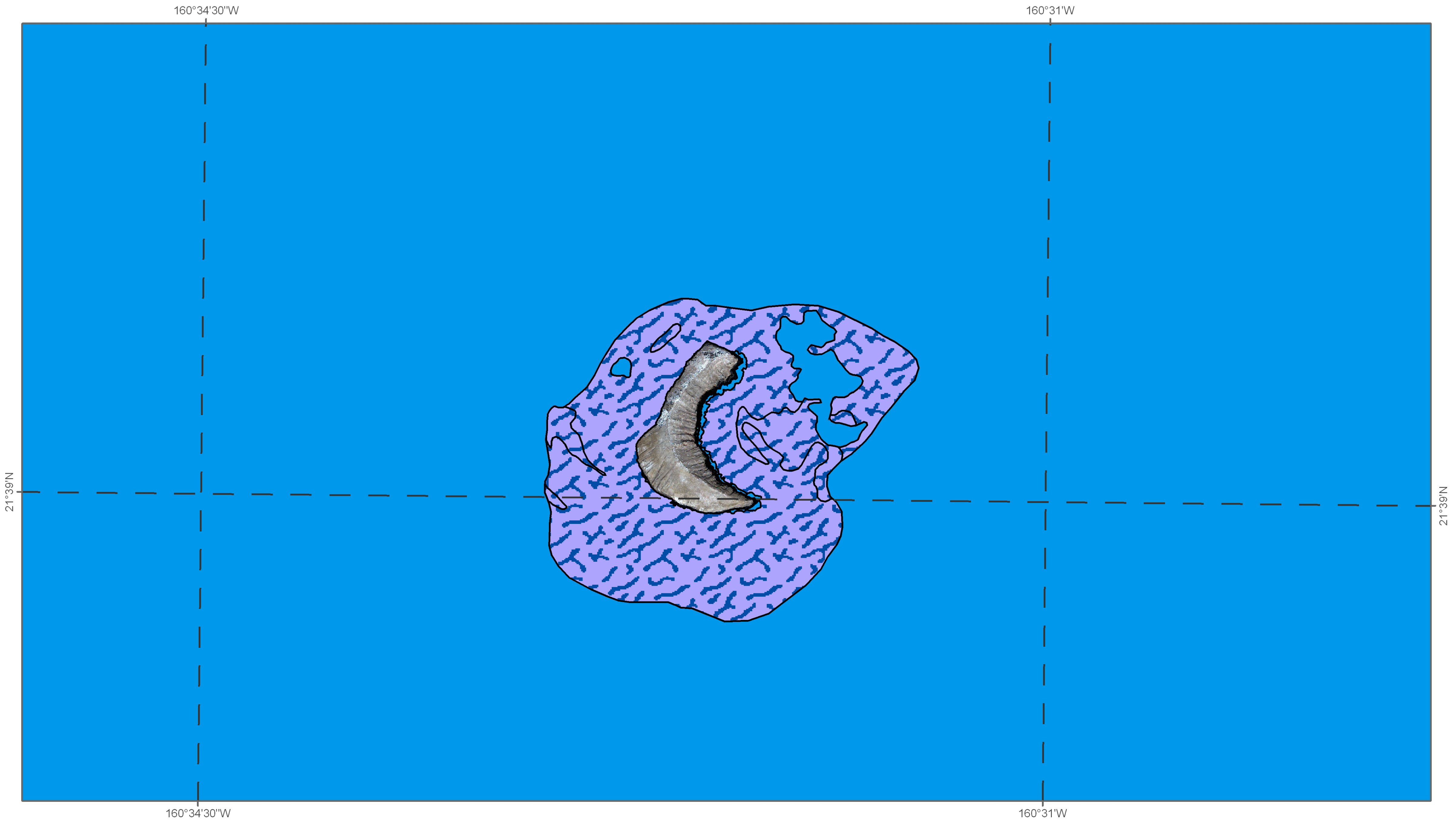
☐ Minimum Mapping Unit (1 Acre)

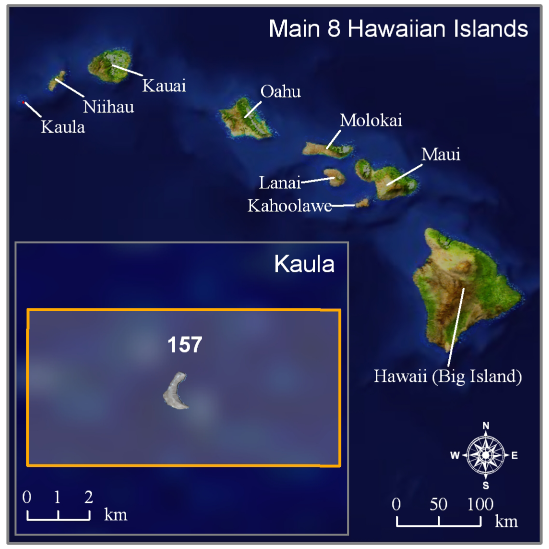
0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

mi 1 0.5 0

Main 8 Hawaiian Islands (Kaula) : Shallow-water Benthic Habitats (Frame 157)


160°34'30"W
160°31'W
21°39'N
21°39'N
160°34'30"W
160°31'W


Main 8 Hawaiian Islands
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Kaula
157
Hawaii (Big Island)
0 1 2
km
0 50 100
km

Geomorphological Structure Types

- 🟥 Aggregate Reef
- 🟥 Aggregated Patch Reef
- 🟥 Individual Patch Reef
- 🟥 Scattered Coral/Rock
- 🟥 Spur and Groove
- ▨ Pavement
- ▨ Pavement with Sand Channels
- ▨ Rock/Boulder
- ▨ Rubble
- ▨ Artificial
- 🟫 Mud
- 🟨 Sand
- 🟦 Unknown

□ Minimum Mapping Unit (1 Acre)

0 0.5 1 1.5 km

Map prepared by the National Ocean Service, Biogeography Branch,
in cooperation with Analytical Laboratories of Hawaii. 2007
For more information: http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

1 0.5 0 mi